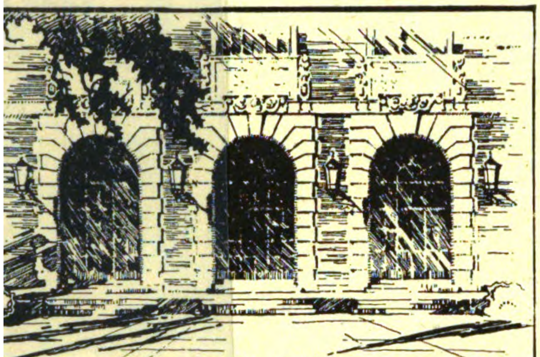

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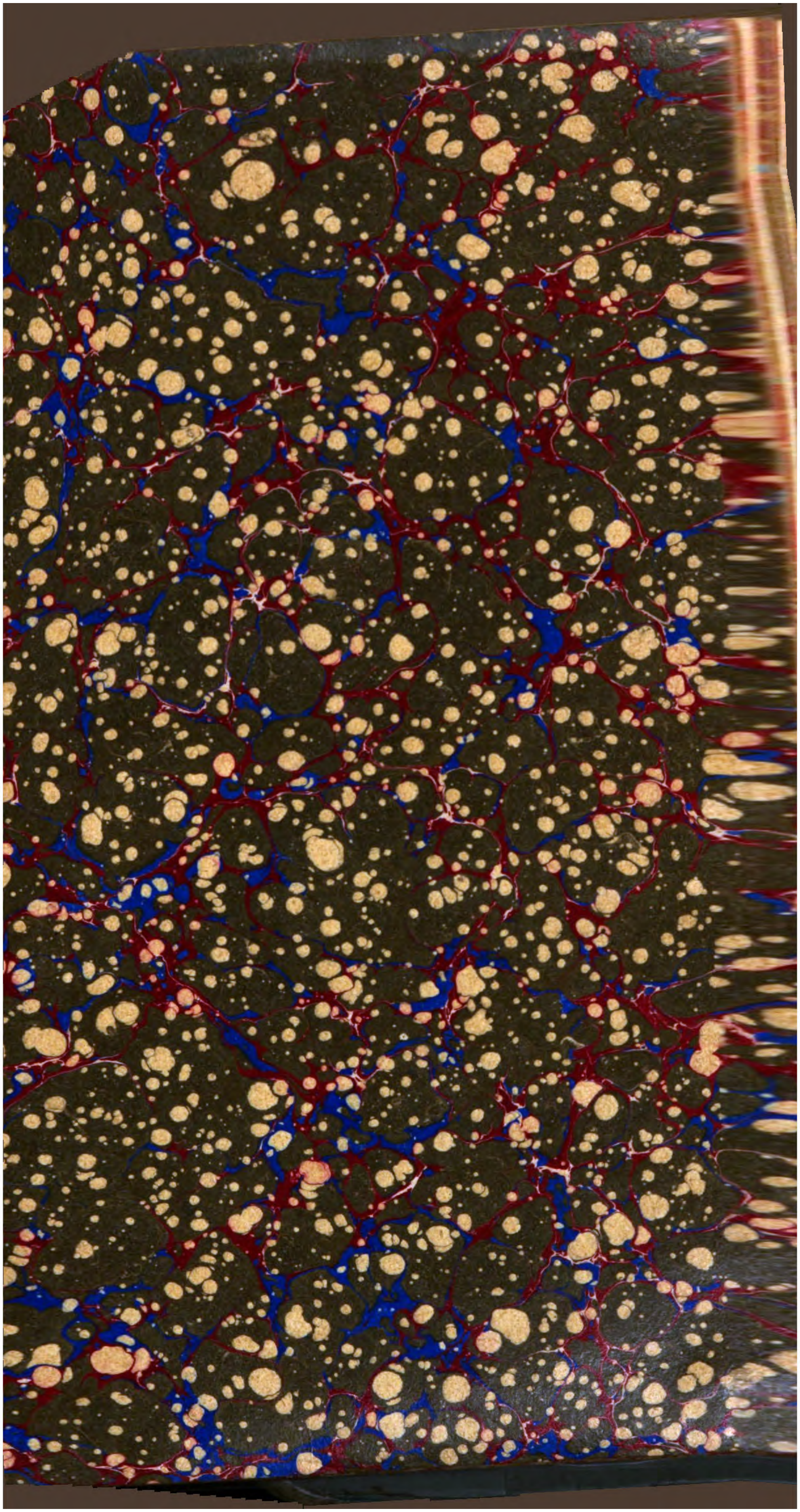

ALDEN'S

MANIFOLD CYCLOPEDIA

OF

KNOWLEDGE AND LANGUAGE.

WITH ILLUSTRATIONS.

VOL. 27.

O'FALLON—PALMIPED.

NEW YORK
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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(-) **is the mark dividing words respelt phonetically into syllables; (′), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.**

Sound-symbols employed in Respelling.	**Representing the Sounds as exemplified in the Words.**	**Words respelt with Sound-symbols and Marks for Pronunciation.**
ā	mate, fate, fail, aye	*māt, fāt, fāl, ā.*
ă	mat, fat	*măt, făt.*
â	far, calm, father	*fâr, kâm, fâ'thėr.*
ä	care, fair	*cär, fär.*
aw	fall, laud, law	*fawl, lawd, law.*
ē	mete, meat, feet, free	*mēt, mēt, fēt, frē.*
ĕ	met, bed	*mĕt, bĕd.*
ė	her, stir, heard, cur	*hėr, stėr, hėrd, kėr.*
ī	pine, ply, height	*pīn, plī, hīt.*
ĭ	pin, nymph, ability	*pĭn, nĭmf, ă-bĭl'ĭ-tĭ.*
ō	note, toll, soul	*nōt, tōl, sōl.*
ŏ	not, plot	*nŏt, plŏt.*
ô	move, smooth	*môv, smôth.*
õ	Goethe (similar to *e* in her)	*gõ'tėh.*
ow	noun, bough, cow	*nown, bow, kow.*
oy	boy, boil	*boy, boyl.*
ū	pure, dew, few	*pūr, dū, fū.*
ŭ	bud, come, tough	*bŭd, kŭm, tŭf.*
û	full, push, good	*fûl, pûsh, gûd.*
ũ	French plume, Scotch guid	*plũm, gũd.*
ch	chair, match	*chār, măch.*
ċh	German buch, Heidelberg, Scotch loch (guttural)	*bôċh, hī'dĕl-bĕrċh, lŏċh.*
g	game, go, gun	*gām, gō, gŭn.*
j	judge, gem, gin	*jŭj, jĕm, jĭn.*
k	king, cat, cot, cut	*kĭng, kăt, kŏt, kŭt.*
s	sit, scene, cell, city, cypress	*sĭt, sēn, sĕl, sĭt'ĭ, sī'prĕs.*
sh	shun, ambition	*shŭn, ăm-bĭsh'ŭn.*
th	thing, breath	*thĭng, brĕth.*
th	though, breathe	*thō, brēth.*
z	zeal, maze, muse	*zēl, māz, mūz.*
zh	azure, vision	*ăzh'ėr, vĭzh'ŭn.*

ABBREVIATIONS USED IN THIS WORK.

a., *or* adj	adjective
A.B	Bachelor of Arts
abbr	abbreviation, abbreviated
abl. *or* abla.	ablative
Abp	Archbishop
abt	about
Acad	Academy
acc. *or* ac.	accusative
accom	accommodated, accommodation
act	active
A.D.	in the year of our Lord [*Anno Domini*]
Adjt	Adjutant
Adm	Admiral
adv. *or* ad.	adverb
A. F.	Anglo-French
Ag	Silver [*Argentum*]
agri	agriculture
A. L.	Anglo-Latin
Al	Aluminium
Ala	Alabama
Alb	Albanian
alg	algebra
A.M.	before noon [*ante meridiem*]
A.M	Master of Arts
Am	Amos
Amer	America, -n
anat	anatomy, anatomical
anc	ancient, anciently
AN. M.	in the year of the world [*Anno Mundi*]
anon	anonymous
antiq	antiquity, antiquities
aor	aorist, -ic
app	appendix
appar	apparently
Apr	April
Ar	Arabic
arch	architecture
archæol	archæology
arith	arithmetic
Ark	Arkansas
art	article
artil	artillery
AS.	Anglo-Saxon
As	Arsenic
Assoc	Association
asst	assistant
astrol	astrology
astron	astronomy
attrib	attributive
atty	attorney
at. wt	atomic weight
Au	Gold [*Aurum*]
A.U.C	in the year of the building of the city (Rome) [*Anno urbis conditæ*]
Aug	August
aug	augmentative
Aust	Austrian
A. V.	authorized version [of Bible, 1611]
avoir	avoirdupois
B	Boron
B	Britannic
b	born
Ba	Barium
Bart	Baronet
Bav	Bavarian
bl.; bbl	barrel; barrels
B.C	before Christ
B.C.L.	Bachelor of Civil Law
B.D.	Bachelor of Divinity
bef	before
Belg	Belgic
Beng	Bengali
Bi	Bismuth
biog	biography, biographical
biol	biology
B.L.	Bachelor of Laws
Bohem	Bohemian
bot	botany, botanical
Bp	Bishop
Br	Bromine
Braz	Brazilian
Bret	Breton
Brig	Brigadier
Brit	British, Britannica
bro	brother
Bulg	Bulgarian
bush	bushel, bushels
C	Carbon
c	century
Ca	Calcium
Cal	California
Camb	Cambridge
Can	Canada
Cant	Canterbury
cap	capital
Capt	Captain
Card	Cardinal
carp	carpentry
Cath	Catholic
caus	causative
cav	cavalry
Cd	Cadmium
Ce	Cerium
Celt	Celtic
cent	central
cf	compare [*confer*]
ch *or* chh.	church

ABBREVIATIONS.

Chal	Chaldee
chap	chapter
chem	chemistry, chemical
Chin	Chinese
Chron	Chronicles
chron	chronology
Cl	Chlorine
Class	Classical [= Greek and Latin]
Co	Cobalt
Co	Company
co	county
cog	cognate [with]
Col	Colonel
Col	Colossians
Coll	College
colloq	colloquial
Colo	Colorado
Com	Commodore
com	commerce, commercial
com	common
comp	compare
comp	composition, compound
compar	comparative
conch	conchology
cong	congress
Congl	Congregational
conj	conjunction
Conn *or* Ct.	Connecticut
contr	contraction, contracted
Cop	Coptic
Cor	Corinthians
Corn	Cornish
corr	corresponding
Cr	Chromium
crystal	crystallography
Cs	Cæsium
ct	cent
Ct. *or* Conn.	Connecticut
Cu	Copper [*Cuprum*]
cwt	a hundred weight
Cyc	Cyclopedia
D	Didymium
D. *or* Dut.	Dutch
d	died
d. [l. s. d.]	penny, pence
Dan	Daniel
Dan	Danish
dat	dative
dau	daughter
D. C.	District of Columbia
D.C.L.	Doctor of Civil [or Common] Law
D.D.	Doctor of Divinity
Dec	December
dec	declension
def	definite, definition
deg	degree, degrees
Del	Delaware
del	delegate, delegates
dem	democratic
dep	deputy
dep	deponent
dept	department
deriv	derivation, derivative
Deut	Deuteronomy
dial	dialect, dialectal
diam	diameter
Dic	Dictionary
diff	different, difference
dim	diminutive
dist	district
distrib	distributive
div	division
doz	dozen
Dr	Doctor
dr	dram, drams
dram	dramatic
Dut. *or* D.	Dutch
dwt	pennyweight
dynam *or* dyn	dynamics
E	Erbium
E. *or* e	East, -ern, -ward
E. *or* Eng.	English
Eccl	Ecclesiastes
eccl. *or* eccles	ecclesiastical [affairs]
ed	edited, edition, editor
e.g	for example [*ex gratia*]
E. Ind. *or* E. I.	East Indies, East Indian
elect	electricity
Emp	Emperor
Encyc	Encyclopedia
Eng. *or* E.	English
engin	engineering
entom	entomology
env. ext	envoy extraordinary
ep	epistle
Eph	Ephesians
Episc	Episcopal
eq. *or* =	equal, equals
equiv	equivalent
esp	especially
Est	Esther
estab	established
Esthon	Esthonian
etc	and others like [*et cetera*]
Eth	Ethiopic
ethnog	ethnography
ethnol	ethnology
et seq	and the following [*et sequentia*]
etym	etymology
Eur	European
Ex	Exodus
exclam	exclamation
Ezek	Ezekiel
Ezr	Ezra
F	Fluorine
F. *or* Fahr	Fahrenheit
f. *or* fem	feminine
F. *or* Fr	French
fa	father
Fahr. *or* F.	Fahrenheit
far	farriery
Fe	Iron [*Ferrum*]
Feb	February
fem *or* f.	feminine
fig	figure, figuratively
Fin	Finnish
F.—L.	French from Latin
Fla	Florida
Flem	Flemish
for	foreign
fort	fortification
Fr. *or* F.	French
fr	from

ABBREVIATIONS.

freq	frequentative
Fris	Frisian
ft	foot, feet
fut	future
G. *or* Ger	German
G	Glucinium
Ga	Gallium
Ga	Georgia
Gael	Gaelic
Gal	Galatians
gal	gallon
galv	galvanism, galvanic
gard	gardening
gen	gender
Gen	General
Gen	Genesis
gen	genitive
Geno	Genoese
geog	geography
geol	geology
geom	geometry
Ger	German, Germany
Goth	Gothic
Gov	Governor
govt	government
Gr	Grand, Great
Gr	Greek
gr	grain, grains
gram	grammar
Gr. Brit	Great Britain
Gris	Grisons
gun	gunnery
H	Hegira
H	Hydrogen
h	hour, hours
Hab	Habakkuk
Hag	Haggai
H. B. M.	His [or Her] Britannic Majesty
Heb	Hebrew, Hebrews
her	heraldry
herpet	herpetology
Hg	Mercury [*Hydrargyrum*]
hhd	hogshead, hogsheads
Hind	Hindustani, Hindu, or Hindi
hist	history, historical
Hon	Honorable
hort	horticulture
Hos	Hosea
Hung	Hungarian
Hydros	Hydrostatics
I	Iodine
I.; Is	Island; Islands
Icel	Icelandic
ichth	ichthyology
Ida	Idaho
i.e.	that is [*id est*]
Ill	Illinois
illus	illustration
impera *or* impr	imperative
impers	impersonal
impf *or* imp.	imperfect
impf. p. *or* imp	imperfect participle
improp	improperly
In	Indium
in	inch, inches
incept	inceptive
Ind	India, Indian
Ind	Indiana
ind	indicative
indef	indefinite
Indo-Eur	Indo-European
inf	infantry
inf *or* infin.	infinitive
instr	instrument, -al
int	interest
intens	intensive
interj. *or* int	interjection
interrog	interrogative pronoun
intr. *or* intrans	intransitive
Io	Iowa
Ir	Iridium
Ir	Irish
Iran	Iranian
irr	irregular, -ly
Is	Isaiah
It	Italian
Jan	January
Jap	Japanese
Jas	James
Jer	Jeremiah
Jn	John
Josh	Joshua
Jr	Junior
Judg	Judges
K	Potassium [*Kalium*]
K	Kings [in Bible]
K	king
Kan	Kansas
Kt	Knight
Ky	Kentucky
L	Latin
L	Lithium
l. [l. s. d.], *or* £	pound, pounds [sterling]
La	Lanthanium
La	Louisiana
Lam	Lamentations
Lang	Languedoc
lang	language
Lap	Lapland
lat	latitude
lb.; llb. *or* lbs	pound; pounds [weight]
Let	Lettish
Lev	Leviticus
LG	Low German
L.H.D	Doctor of Polite Literature
Lieut	Lieutenant
Lim	Limousin
Lin	Linnæus, Linnæan
lit	literal,-ly
lit	literature
Lith	Lithuanian
lithog	lithograph, -y
LL	Late Latin, Low Latin
LL.D	Doctor of Laws
long	longitude
Luth	Lutheran
M	Middle
M	Monsieur
m	mile, miles
m. *or* masc.	masculine
M.A	Master of Arts
Macc	Maccabees
mach	machinery
Mag	Magazine

ABBREVIATIONS.

Maj	Major
Mal	Malachi
Mal	Malay, Malayan
manuf	manufacturing, manufacturers
Mar	March
masc *or* m.	masculine
Mass	Massachusetts
math	mathematics, mathematical
Matt	Matthew
M.D.	Doctor of Medicine
MD	Middle Dutch
Md	Maryland
ME	Middle English, or Old English
Me	Maine
mech	mechanics, mechanical
med	medicine, medical
mem	member
mensur	mensuration
Messrs. *or* MM	Gentlemen, Sirs
metal	metallurgy
metaph	metaphysics, metaphysical
meteor	meteorology
Meth	Methodist
Mex	Mexican
Mg	Magnesium
M.Gr	Middle Greek
MHG	Middle High German
Mic	Micah
Mich	Michigan
mid	middle [voice]
Milan	Milanese
mid. L. *or* ML.	Middle Latin, Mediæval Latin
milit. *or* mil	military [affairs]
min	minute, minutes
mineral	mineralogy
Minn	Minnesota
Min. Plen	Minister Plenipotentiary
Miss	Mississippi
ML. *or* mid. L.	Middle Latin, Mediæval Latin
MLG	Middle Low German.
Mlle	Mademoiselle
Mme	Madam
Mn	Manganese
Mo	Missouri
Mo	Molybdenum
mod	modern
Mont	Montana
Mr	Master [Mister]
Mrs	Mistress [Missis]
MS.; MSS	manuscript; manuscripts
Mt	Mount, mountain
mus	music
MUS. DOC.	Doctor of Music
myth	mythology, mythological
N	Nitrogen
N. *or* n	North, -ern, -ward
n	noun
n *or* neut	neuter
Na	Sodium [*Natrium*]
Nah	Nahum
N. A., *or* N. Amer.	North America, -n
nat	natural
naut	nautical
nav	navigation, naval affairs
Nb	Niobium
N. C. *or* N. Car	North Carolina
N. D	North Dakota
Neb	Nebraska
neg	negative
Neh	Nehemiah
N. Eng	New England
neut *or* n	neuter
Nev	Nevada
N.Gr	New Greek, Modern Greek
N. H	New Hampshire
NHG	New High German [German]
Ni	Nickel
N. J	New Jersey
NL	New Latin, Modern Latin
N. Mex	New Mexico
N. T., *or* N. Test	New Testament
N. Y	New York [State]
nom	nominative
Norm. F	Norman French
North. E	Northern English
Norw	Norwegian, Norse
Nov	November
Num	Numbers
numis	numismatics
O	Ohio
O	Old
O	Oxygen
Obad	Obadiah
obj	objective
obs. *or* †	obsolete
obsoles	obsolescent
O.Bulg	Old Bulgarian or Old Slavic
Oct	October
Odontog	odontography
OE	Old English
OF *or* O. Fr	Old French
OHG	Old High German
Ont	Ontario
opt	optics, optical
Or	Oregon
ord	order
ord	ordnance
org	organic
orig	original, -ly
ornith	ornithology
Os	Osmium
OS.	Old Saxon
O. T., *or* O. Test	Old Testament
Oxf	Oxford
oz	ounce, ounces
P	Phosphorus
p.; pp	page; pages
p., *or* part	participle
Pa. *or* Penn.	Pennsylvania
paint	painting
palæon	palæontology
parl	parliament
pass	passive

ABBREVIATIONS.

pathol *or* path	pathology
Pb	Lead [*Plumbum*]
Pd	Palladium
Penn *or* Pa.	Pennsylvania
perf	perfect
perh	perhaps
Pers	Persian, Persic
pers	person
persp	perspective
pert	pertaining [to]
Pet	Peter
Pg. *or* Port.	Portuguese
phar	pharmacy
PH.D	Doctor of Philosophy
Phen	Phenician
Phil	Philippians
Philem	Philemon
philol	philology, philological
philos. *or* phil	philosophy, philosophical
phonog	phonography
photog	photography
phren	phrenology
phys	physics, physical
physiol	physiology, physiological
Pied	Piedmontese
Pl	Plate
pl. *or* plu	plural
Pl. D	Platt Deutsch
plupf	pluperfect
P.M	afternoon[*post meridiem*]
pneum	pneumatics
P. O	Post-office
poet	poetical
Pol	Polish
pol. econ	political economy
polit	politics, political
pop	population
Port. *or* Pg.	Portuguese
poss	possessive
pp	pages
pp	past participle, perfect participle
p. pr	present participle
Pr. *or* Prov.	Provençal
pref	prefix
prep	preposition
Pres	President
pres	present
Presb	Presbyterian
pret	preterit
prim	primitive
priv	privative
prob	probably, probable
Prof	Professor
pron	pronoun
pron	pronunciation, pronounced
prop	properly
pros	prosody
Prot	Protestant
Prov. *or* Pr.	Provençal
Prov	Proverbs
prov	province, provincial
Prov. Eng.	Provincial English
Prus	Prussia, -n
Ps	Psalm, Psalms
psychol	psychology
pt	past tense
pt	pint
Pt	Platinum
pub	published, publisher, publication
pwt	pennyweight
Q	Quebec
qt	quart
qtr	quarter [weight]
qu	query
q.v.	which see [*quod vide*]
R	Rhodium
R	River
Rb	Rubidium
R. Cath	Roman Catholic
rec. sec	recording secretary
Ref	Reformed
refl	reflex
reg	regular, -ly
regt	regiment
rel. pro. *or* rel	relative pronoun
repr	representing
repub	republican
Rev	Revelation
Rev	The Reverend
Rev. V	Revised Version
rhet	rhetoric, -al
R. I	Rhode Island
R. N	Royal Navy
Rom	Roman, Romans
Rom	Romanic or Romance
Rom. Cath. Ch. *or* R. C. Ch	Roman Catholic Church
r.r.	railroad
Rt. Rev	Right Reverend
Ru	Ruthenium
Russ	Russian
r.w.	railway
S	Saxon
S	Sulphur
s	second, seconds
s. [l. s. d.]	shilling, shillings
S. *or* s	South, -ern, -ward
S. A. *or* S. Amer.	South America, -n
Sam	Samaritan
Sam	Samuel
Sans, *or* Skr	Sanskrit
Sb	Antimony [*Stibium*]
s.c	understand, supply, namely [*scilicet*]
S. C. *or* S. Car	South Carolina
Scand	Scandinavian
Scot	Scotland, Scotch
scr	scruple, scruples
Scrip	Scripture [s], Scriptural
sculp	sculpture
S. D	South Dakota
Se	Selenium
sec	secretary
sec	section
Sem	Semitic
Sep	September
Serv	Servian
Shaks	Shakespeare
Si	Silicon

ABBREVIATIONS.

Sic	Sicilian
sing	singular
sis	sister
Skr. *or* Sans	Sanskirt
Slav	Slavonic, Slavic
Sn	Tin [*Stannum*]
Soc	Society
Song Sol	Song of Solomon
Sp	Spanish
sp. gr	specific gravity
sq	square
Sr	Senior
Sr	Strontium
	Saint
	street
stat	statute
S.T.D	Doctor of Sacred Theology
subj	subjunctive
suf	suffix
Su. Goth	Suo-Gothic
superl	superlative
Supp	Supplement
Supt	Superintendent
surg	surgery, surgical
Surv	surveying
Sw	Swedish
Swab	Swabian
sym	symbol
syn	synonym, -y
Syr	Syriac, Syrian
t	town
Ta	Tantalum
Tart	Tartar
Te	Tellurium
technol	technology
teleg	telegraphy
Tenn	Tennessee
term	termination
terr	territory
Teut	Teutonic
Tex	Texas
Th	Thorium
theat	theatrical
theol	theology, theological
therap	therapeutics
Thess	Thessalonians
Ti	Titanium
Tim	Timothy
Tit	Titus
Tl	Thallium
toxicol	toxicology
tp	township
tr. *or* trans	transitive
transl	translation, translated
trigon	trigonometry
Turk	Turkish
typog	typography, typographical
U	Uranium
ult	ultimate, -ly
Unit	Unitarian
Univ	Universalist
Univ	University
U. Presb	United Presbyterian
U. S	United States
U. S. A	United States Army
U. S. N	United States Navy
Ut	Utah
V	Vanadium
v	verb
Va	Virginia
var	variant [word]
var	variety of [species]
Ven	Venerable
Venet	Venetian
vet	veterinary
v. i. *or* v. intr	verb intransitive
vil	village
viz	namely, to-wit [*videlicet*]
v. n	verb neuter
voc	vocative
vol	volume
vols	volunteers
Vt	Vermont
v. tr	verb transitive
W	Tungsten [*Wolfram*]
W	Welsh
W. *or* w	West, -ern, -ward
Wal	Walachian
Wall	Walloon
Wash	Washington
Westph	Westphalia, -n
W. Ind. *or* W. I	West Indies, West Indian
Wis	Wisconsin
wt	weight
W. Va	West Virginia
Wyo	Wyoming
Y	Yttrium
yd	yard
yr	year
Zech	Zechariah
Zeph	Zephaniah
Zn	Zinc
zool	zoology, zoological
Zr	Zirconium

See also ABBREVIATIONS in Vol. I.

ALDEN'S

MANIFOLD CYCLOPEDIA.

O'FALLON, *ō-făl'lon,* JOHN: 1791, Nov. 23—1865, Dec. 18; b. Louisville, Ky.; son of Dr. James O'F., who emigrated to Wilmington, N. C., 1774. The son served under Gen. William H. Harrison, and was wounded at Tippecanoe. He fought also in the war of 1812. He acquired a fortune as a merchant in St. Louis, Mo., and gave more than $1,000,000 to charitable and educational institutions, including the endowment of $100,000 to the O'Fallon Polytechnic Institute, now part of St. Louis Univ. He gave liberally to Washington Univ. also, and built a medical coll. and a dispensary. He died in St. Louis.

O'FEN: see BUDA.

OFF: see under OF.

OFFAL, n. *ŏf'făl* [prov. Ger. *affall,* refuse or dross: Dan. *affald,* a falling away, offal]: that which is thrown away as of no value, as certain parts of an animal butchered; refuse; coarse meat; rubbish. *Note.*—OFFAL was formerly used of chips of wood falling from a cut log, and is merely compounded of OFF and FALL—see Skeat.

OFFA'S DYKE, *of'faz dīk:* remarkable relic of antiquity, an intrenchment extending along the whole border of England and Wales, from the n. coast of Flintshire, on the estuary of the Dee, through the counties Denbigh, Montgomery, Salop, Radnor, and Hereford, into Gloucestershire, where its s. termination is near the mouth of the Wye, in the grounds of Sedbury Park, which overlook the estuary of the Severn. In some places, it is nearly obliterated by cultivation; in others, it is of considerable height, though its appearance nowhere indicates that it can ever have been of much value as a rampart. It is therefore generally supposed to have been intended chiefly as a line of demarkation. Nearly parallel with it, but at a distance varying from a few hundred yards to three m., on the e. or English side of it, is *Watt's Dyke,* a similar relic of antiquity, though seeming never to have been so great a work, and now in many places obliterated. It has been conjectured that the space between was neutral ground where the Anglo-Saxons and Welsh met for trading or other purposes. The principal dyke is ascribed by tradition to Offa, King of Mercia, who reigned in the 8th c.; but this is tradition, and not history.

OFFENBACH, *of'fĕn-bâch:* manufacturing town of Hesse-Darmstadt, on the s. bank of the river Main, within the domains of the Princes of Isenburg-Birstein, 4 m. s.e. of Frankfurt. Pop. (1880) 28,449. O. is pleasantry situated in one of the richest parts of the valley of the Main, and is one of the most important manufacturing towns in the province. Among industrial products, its carriages have acquired high repute; and next to these, its bookbindings, articles of jewelry, gold and silver goods, carpets, and silk fabrics. It has also good manufactories of wax-cloth, papier-mâché snuff-boxes, tin-lacquered wares, umbrellas and parasols, wax candles, leather, hats, tobacco, sugar, and ginger-bread and spiced cakes. O. has several churches, and a Jewish synagogue. The palace is the winter residence of the Isenburg-Birstein family, to whom the old castle, now in ruins, belongs. A pontoon-bridge crosses the river, and there is a railway to Frankfurt.

OF'FENBACH, JACQUES: 1819, June 21—1880, Oct. 4; b. Cologne, of Jewish parentage: a naturalized Frenchman, composer of dramatic music highly popular over the continent of Europe. He studied music in Paris 1833, was admitted, as violoncellist, to the orchestra of the Opéra Comique 1834; exercised great tact, quickness of perception of popular taste, and amazing industry; became *chef d'orchestre* in the Théâtre Français 1847; and 1855 opened the Bouffes Parisiens (formerly the Théâtre Comte). Here his brilliant trifles drew crowds, and his success as introducer of a new form of opera bouffe culminated 1867 in *La Grande Duchesse de Gérolstein*, which captured the public in Europe and America. Other of O.'s popular burlesque operas are *Orphée aux Enfers*, *La Belle Hélène*, *La Barbe Bleu*, *Geneviève de Brabant*. He composed also numerous light lively operettas. O. worked to suit the popular taste, or to lead that taste into paths instantly acceptable to it. His work was not educational in a good sense; it was brilliantly diverting. It lacks refinement, high aim, and artistic principle. It had for its object the gaining of popular favor, and its success in this was complete.

OFFENCE: see OFFENSE.

OFFEND, v. *ŏf-fĕnd'* [F. *offendre*, to offend, to hurt—from L. *offendĕrĕ*, to strike or dash against a thing: It. *offendere*]: to pain; to annoy; to displease; to affront; to sin; to cause dislike or anger; to commit transgression. OFFEND'ING, imp.: ADJ. displeasing; causing anger; committing sin. OFFEND'ED, pp.: ADJ. displeased. OFFENDER, n. *ŏf-fĕnd'ėr*, one who gives offense; a criminal; a guilty person.—SYN. of 'offend': to anger; assail; attack; transgress; violate; injure; vex; mortify; shock; wound; scandalize.

OFFENSE, n. *ŏf-fĕns'* [F. *offense*—from L. *offensārĕ*, to strike or dash against a thing; *offensa*, an injury, an offense: It. *offensa*]: displeasure given or received; affront; injury; cause of sin; a sin; a fault; a crime. Offense'less, a. *-lĕs*, free from a disposition to offend. Offense'lessly, ad. *-lĭ*. Offensive, a. *ŏf-fĕn'sĭv*, tending to cause offense, pain, or disgust; rude; insulting; used in attack; assailant; making the first attack: N. the part of attacking; a state or posture of attack. Offen'sively, ad. *-lĭ*. Offen'siveness, n. *-nĕs*, the quality or condition of being offensive; unpleasantness. To act on the offensive, to be the attacking party.—Syn. of 'offense': wickedness; transgression; displeasure; scandal; outrage; anger; attack; umbrage; resentment; misdeed; misdemeanor; trespass; delinquency; indignity; insult;—of 'offensive': displeasing; disgusting; injurious; disagreeable; distasteful; obnoxious; abhorrent; impertinent; saucy; attacking; scurrilous; abusive; insolent; opprobrious.

OFFENSES against Religion, Public Peace, etc.: see Religion: Peace: etc.

OFFENSIVE, OFFENSIVELY: see under Offense.

OFFER, n. *ŏf'fėr* [L. *offerrĕ*, to bring or thrust forward —from *ob*, in the way; *fero*, I bring: It. *offerire:* F. *offrir*]: a proposal; first advance; the act of bidding a price; the sum bid: V. to make a proposal to; to present either to be accepted or rejected; to present in prayer or worship; to sacrifice; to bid, as, a price or reward; to exhibit; to attempt or make an attempt, as, they *offered* to land; to present itself; to declare a willingness. Of'fering, imp.: N. that which is offered; a gift presented at the altar as an act of worship (see First-fruits: Sacrifice: Offertory); certain customary payments to the clergy. Offered, pp. *ŏf'fėrd*. Of'ferer, n. *-ėr*, one who offers. Of'ferable, a. *-ă-bl*, that may be offered. Offering day, in the *Anglican Church*, a day of customary alms and offerings for the poor. The custom, still to some extent retained, is observed on Christmas day, Easter day, and on two other days, of which Whitsunday is often one.—Syn. of 'offer, v.': to present; immolate; bid; attempt; commence; propose; give; propound; move; proffer; tender.

OFFER AND ACCEPTANCE: one mode of entering into a contract of sale. At an auction, the highest offer is generally accepted as a matter of course; and when accepted, the contract is complete. An offer is often made by letter from one merchant to another to buy or sell goods. In such a case, the party offering is bound to await an answer by return of post or other means of message, and later than such return where there are several mails in a day; for until after some reasonable time for reply, the offer is supposed to be continuously made. But if A offer to B personally to sell, and B ask time to consider for a day, or any given time, A is not in usual cases bound to grant such time beyond the termination of the interview.

OFFERTOIRE, *ŏ-fėr-twar:* **French for Offertory (q.v.).**

OFFERTORY, n. *ŏf'fėr-tėr-ĭ* [F. *offertoire*, an offertory—from *offrir*, to offer: mid. L. *offertōrĭŭm*, a place to which offerings were brought, an offertory (see OFFER)]: that which is offered; the sentences in the Communion service read in church while the alms are collecting; the alms collected as a part of public Divine service. Offertory is the name given to that portion of the public liturgy of the Rom. Cath. Chh. with which the eucharistic service, strictly so called, commences. In the Roman Liturgy it consists of one or two verses from some book of Scripture, usually the Old Test., but sometimes from the Epistles. In the Ambrosian Liturgy it consists of a prayer, similar in form to the *collect* or *secret* of the mass; and in both, this recital is followed by the preparatory offering up of the bread and wine, accompanied by certain ceremonies and forms of prayer.

This offering of the bread and wine in the public service became, from a very early period, the occasion of a voluntary offering, on the part of the faithful; originally, it is probable, of the bread and wine designed for the eucharistic celebration and for the communion of the priest and the congregation (sometimes including also the absent members), also for the *agape* or common sacred feast which accompanied it. That portion of the offerings which remained in excess of what was requisite for these purposes was applied to the relief of the poor, and to the support of the clergy. These offerings were made ordinarily by the faithful in person, and were laid upon the altar; and the Ambrosian rite still preserves this usage in the ceremonial of the cathedral of Milan. By degrees, other gifts were added to those of bread and wine—as corn, oil, wax, honey, eggs, butter, fruits, lambs, fowl, and other animals; and eventually equivalents in money or other objects of value. The last-named class of offerings, however, was not so commonly made upon the altar and during the public liturgy, as in the form of free gifts presented on the occasion of other ministerial services, as baptism, marriages, funerals, etc.; and from this has arisen the practice in the Rom. Cath. Chh. of the mass-offering, or *honorarium*, which is given to a priest with the understanding that he shall offer the mass for the intention (whence the honorarium itself is often called an 'intention') of the offerent. In some places, however, and among them in parts of Ireland, offerings 'in kind' are still in use, not indeed in the form of the ancient offertory, but in the shape of contributions of corn, hay, etc., at stated seasons, for the use of the parochial clergy. At weddings also, and in some places at funerals, offerings in money are made by the relations and friends of the newly married or of the deceased. In the Liturgy of the English Church, allusion is made to the practice of oblations, and some recent controversies have related to the revival of the ancient 'offertory,' which has found some advocates.—The O. is coming into use in non-prelatical churches in the simple form of a few dedicatory words recognizing and rendering the contributions of the congregation as their offering to God.

OFFICE, n. *ŏf'ĭs* [F. *office*, office, worship—from L. *offĭcĭŭm*, service, duty—from *opem*, aid, help; *facĕrĕ*, to do: It. *officio*]: settled duty; employment; business: peculiar use or function: act of kindness: formulary of worship or devotion; act of worship: house or apartment where commercial men, etc., transact their business; a counting-house: a function; position or function of one in public administration; department, as of state: PLU. the outlying parts, as stables, etc., of a mansion or palace. **OFFICE-BEARER**, one who holds an office. **OFFICER**, n. *ŏf'fĭ-sėr*, one authorized to perform some public duty (see OFFICE, in Law); one holding a place of authority in the army and navy.—*Military Officers* are combatant and non-combatant—non-combatant including Paymasters (q.v.), medical officers (see SURGEON, ARMY AND NAVY), Commissariat (q.v.) and other civil officers. The great divisions of rank are commissioned (see COMMISSIONS), warrant, and Non-commissioned Officers (q.v.). Commissioned officers comprise all holding the rank of sub-lieut., or corresponding or superior rank. Divided by duties, they are Staff Officers (see STAFF), or Regimental Officers (see REGIMENT); divided by rank, General Officers (q.v.), Field-officers (q.v.), and troop or company officers. The last are captains, lieutenants, and sub-lieutenants, and, except in the cavalry, are unmounted.—See PROMOTION: ARMY: PURCHASE SYSTEM: WARRANT OFFICERS: NON-COMMISSIONED OFFICERS: also titles of the various ranks.—*Naval Officers* are commissioned, warrant, and petty officers. Commissioned officers are admirals, captains, commanders, lieutenants, and sub-lieutenants: see these titles. Warrant Officers (q.v.) are boatswains, carpenters, gunners, and one class of engineers. Petty Officers (q.v.) constitute an important portion of the management in a ship-of-war. **OFFICER**, v. to furnish or supply with officers. **OF'FICERING**, imp. **OF'FICERED**, pp. *-sėrd:* ADJ. furnished or supplied with officers. **OFFICIAL**, a. *ŏf-fĭsh'ăl* [F.—L.]: pertaining to or derived from the proper office or authority; done by virtue of authority: N. one invested with office; a subordinate executive officer or attendant. **OFFI'CIALLY**, ad. *-lĭ*, by authority; by virtue of an office. **OFFICIATE**, v. *ŏf-fĭsh'ĭ-āt*, to act by virtue of an office; to perform official duty for another, said of a clergyman; in *OE.*, to give in consequence of office. **OFFI'CIATING**, imp.: ADJ. performing an office. **OFFI'CIATED**, pp. **OFFICIOUS**, a. *ŏf-fĭsh'ŭs* [L. *officiōsus*, obliging]: unduly forward in interposing services; intermeddling; busy; in *OE.*, doing good offices; kind. **OFFI'CIOUSLY**, ad. *-lĭ*. **OFFI'CIOUSNESS**, n. *-nĕs*, the quality of being officious: undue forwardness. **OFFICE COPY**, an official copy: in *law*, copy made of a document by some officer of a court in whose custody the document is: in general such copies are receivable in evidence without further proof in the same court, but not in other courts except as some statute makes them evidence. **OFFICE FOUND**: see INQUEST OF OFFICE. **OFFICIAL ASSIGNEE**, a public officer appointed to manage the estate of a bankrupt: where the law provides such an official, a bankrupt's estate vests in him as soon as an adjudication of bankruptcy is made. He is the manager of the property, and can sell the estate under the directions of the court in urgent cases, e.g., when the goods are perishable; but in general he is assisted in the management by the creditors' assignees selected from the body of creditors by the other creditors' votes. OFFICIAL MANAGER, an officer appointed to manage the winding up of the affairs of a joint-stock company. DIVINE OFFICE, the name popularly given to the CANONICAL HOURS (q.v.) prescribed to be read each day by bishops, priests, deacons, and sub-deacons in the Roman Cath. Chh.: see BREVIARY. The special portions assigned for any particular day constitute what is called the divine office for that day; and each person who is bound in virtue of his order to recite the Breviary, is obliged, under pain of sin, to read, not merely with the eye, but with distinct, though it may be silent, articulation, each and all these portions. The adjustment of the portions of the office of each day, the combination of the 'ordinary' portions which are read every day in common, with the parts 'proper' for each particular day, is a matter of considerable difficulty, and is regulated by a complicated system of RUBRICS (q.v.). HOLY OFFICE, applied popularly to the Inquisition; properly to *The Congregation of the Holy Office,* i.e., the 'Congregation' at Rome, to which the direction of the tribunal of the Inquisition at Rome is subject. This Congregation was established by Paul III. 1542, and its organization was completed by Sixtus V. It consists of 12 cardinals, a commissary, consulters, and qualifiers, whose duty it is to examine and report on each case for information of the cardinals. In the most solemn sessions of the Holy Office the pope himself presides in person. The Holy Office decides questions of heresy, inquires into crimes against faith, and judges ecclesiastical offenses, especially in administration of the sacraments. In the present condition of the papal court, its action is much restricted. See INQUISITION.—SYN. of 'officious': impertinent; meddling; active; meddlesome; forward.

OFFICE, in Law: duty and right to exercise a public function or employment, and to take the fees and emoluments belonging to it. It involves the idea of tenure, duration, fees or emoluments, and powers, as well as duty. An officer is one lawfully invested with an office. Every O. is considered public whose duties concern the public. The holding of O. at a fixed compensation creates no vested right in the incumbent; the law creating the O. and the compensation is in no sense a contract; the offices may therefore be abolished at any time by proper legislation, or the salary may be decreased, or the powers and duties of the O. may be curtailed, unless such legislation is expressly forbidden by the constitution. Offices cannot be bought or sold, nor are they subject to devise; in most states it is a penal offense to barter away for reward the compensation or a part thereof attached to the O., or to allow another not authorized by law to exercise the functions of the O., either directly or indirectly. Offices are either ministerial or judicial: ministerial, when the duties attached are definitely fixed and ascertained and do not involve the exercise of any judicial discretion; judicial when the duties require the exercise of judgment or discretion on the merits of the question presented: an example of the ministerial kind is a constable; the office of a judge is judicial. The same officer may exercise judicial and ministerial duties; e.g., a justice of the peace. This distinction is of importance on account of the nature of the responsibility attached to the two classes. An officer performing ministerial duties is always responsible for any neglect or violation of duty whereby injury is caused to others: an officer, exercising judicial functions and having jurisdiction of the matter on which he acts, incurs no liability for injuries, if he acts with good faith; but he will be civilly responsible if he acts wholly without jurisdiction, or exceeds his jurisdiction and has knowledge of the facts which constitute the defect of jurisdiction. Where a public O. is instituted by the legislature, implied authority is conferred on the officer to bring all suits which the proper and faithful discharge of his official duties requires. An officer *de facto* is one in possession of the O., and receiving the emoluments attached thereto, but whose title is not unquestionable; an officer *de jure* is one who has the legal right to the O., without necessarily having the actual possession of it. There can not be an officer *de jure* and another *de facto* performing the duties of the O. at the same time, but where the officer *de jure* is also officer *de facto*, the acts of another claimant will not protect third persons. A *de facto* officer can not be compelled to act and incurs no liability by his mere cessation of acting. The acts of some officers *de facto* will be effectual and valid, even though they be afterward replaced by the officer *de jure*. Thus the judgments rendered by a judge acting as such, *de facto*, will not be set aside for that reason. The title to O., when in dispute, is generally tested by what are termed *quo warranto* proceedings. The tenure of O. is regulated by statute, and it is usual in the United States to fix a limit for eligibility on the age of incumbents; 70 years usually being the limit. In the absence of fraud or collusion, the acts of public officers, within the limits of the authority conferred on them and in performance of the duties assigned to them in dealing with third persons are the acts of the states. In the United States, public officers are appointed by the pres. with the advice and consent of the senate, except that congress has power to vest in the pres. alone or in the heads of departments, the appointment of 'inferior officers.' The constitution is silent as to whether the consent of the senate is necessary to the removal of an officer by the pres.; congress, in the trial for impeachment of Pres. Johnson, sustained by a very close vote, the right of the pres. to act alone. The appointment and removal of a number of 'inferior officers' is now regulated by what is known as the 'Civil Service Reform' laws. A number of the states have similar statutes: see Civil Service. Ambassadors (q.v.), public ministers, consuls (q.v.), and Supreme court judges, are specified by the constitution of the United States as not being 'inferior officers.' Each state has statutes regulating the appointment of its own officers; in the states most of the officers, especially the head officers, are elected by the people. The tendency has been, in the states, to curtail the power of appointment in the executive.

OFFICINAL, a. *ŏf-fĭs'ĭ-năl* [It. *officinale:* F. *officinal,* sold in the shops—from L. *offĭcīna,* a shop where goods are sold]: kept and sold in shops, or ordered or expected to be kept and sold there. Officinal plants, those medicinal plants which have place in the pharmacopœias of different countries, and which are therefore sold—or some of their products or preparations of them—by apothecaries and druggists. The medicinal plants cultivated to any considerable extent all are officinal, but many not cultivated also are officinal: see Medicinal Plants.

OFFING, n. *ŏf'fĭng* [Eng. *off,* signifying distance from]: that part of the sea at a distance from the shore having deep water: Adj. moving off shore; steering from land.

OFFSCOURING, n. *ŏf'skowr-ĭng* [*off,* and *scour—lit.,* anything scoured off]: rejected matter; that which is vile or despised.

OFFSCUM, n. *ŏf'skŭm* [*off,* and *scum*]: refuse matter; filth: Adj. vile.

OFFSET: a perpendicular from a main line to an outlying point. Let AEF....B....D....C be a field with

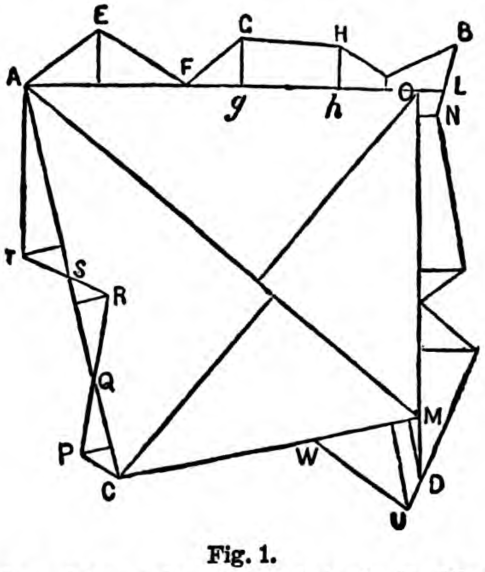


Fig. 1.

very irregular sides; take the points A, O, M, C at or as near the corners as convenient, the object being to inclose as much of the field as possible within the quadrilateral AOMC; and for this purpose it is sometimes necessary, as in the present case, to include a corner (as SRQ) which is outside the field. The area AOCD is found by means of the diagonal AM, and the perpendiculars on it from C and O. The area AEFG....BL is found by dividing it into triangles and trapezoids by means of perpendiculars (to which the term *offsets* was originally applied, though it now denotes the irregular area before mentioned) from the corners E, G, H, etc. (see TRIANGLE: TRAPEZOID), and adding together the areas of the separate figures AEF, FG*g*, GH*gh*, etc. Similarly the areas of OLN....D and MDUW are found. To the sum of these must be added the areas of the triangles ATS, QPC, diminished by the area of SRQ, and the result is the whole area of the field. If the offset have no distinct corners, as (fig. 2) ABLMN ....OK, then the base AK is divided into equal parts by perpendiculars ABL*l*, M*m*, N*n*, etc., and the area of the offset is found approximately as follows: the whole offset $= \mathrm{ABL}l + \mathrm{L}l\mathrm{M}m + \mathrm{M}m\mathrm{N}n +$ etc. $+ \mathrm{P}p\mathrm{OK} = \mathrm{A}l \times \frac{1}{2}(\mathrm{AB} + \mathrm{L}l) + lm \times \frac{1}{2}(\mathrm{L}l + \mathrm{M}m) + mn \times \frac{1}{2}(\mathrm{M}m + \mathrm{N}n) + \ldots\ldots + p\mathrm{K} \times \frac{1}{2}(p\mathrm{P} + \mathrm{OK}) =$ (since the divisions of the base are equal) $\mathrm{A}l \times \frac{1}{2}\{\mathrm{AB} + 2\mathrm{L}l + 2\mathrm{M}m + 2\mathrm{N}n + \ldots\ldots + 2p\mathrm{P} + \mathrm{OK}\} = \mathrm{A}l \times \left\{\frac{\mathrm{AB} + \mathrm{OK}}{2} + \mathrm{L}l + \mathrm{M}m + \mathrm{N}n + \ldots\ldots + \mathrm{P}p\right\}$; i.e., the area of an offset is found approximately by adding the intermediate perpendiculars to the semi-sum of the first and last, and multiplying the sum-total by the length of a division of the base, the divisions being equal; and the greater the number of perpendiculars, the nearer the result is to the true area.

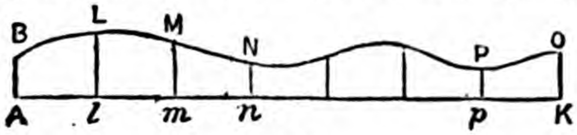


Fig. 2.

OFFSET, n. *ŏf'sĕt*, or SET-OFF [*off*, and *set*]: sum or account or thing placed as an equivalent for another. In *building*, the splay or sloping part of a wall, etc., joining parallel surfaces when the upper face recedes from the lower. This frequently occurs on buttresses (see fig.). The O. is usually protected with dressed stones, having a projection or drip on the lower edge to prevent the rain from running down the wall. In *gardening*, a young shoot or bulb separated from the parent root and growing beside it, springing from the axils of its scales (see BULB): this growth exhausts the plant's strength, but serves for its propagation; the term is seldom applied to other than bulbous-rooted plants cultivated for beauty of flowers.—O. signifies also a terrace upholding a flat on a hillside. O. in *land-measuring* (see below): V. to set off, as one account against another. OFFSET-STAFF, a measuring rod 10 links long, or 6 ft. 7·2 inches.

Offset.

OFFSHOOT, n. *ŏf'shôt* [*off*, and *shoot*]: anything arising from or growing out of another.

OFFSIDE, n. *ŏf'sīd* [*off*, and *side*]: the side to the right hand of the driver.

OFFSKIP, n. *ŏf'skĭp* [*off*, and Dut. *-schap;* AS. *-scipe*, a suffix = Eng. *-ship*, as in friendship]: a term used by some writers on art to indicate that part of a landscape which recedes from the spectator into distance.

OFFSPRING, n. *ŏf'sprĭng* [*off*, and *spring*]: children; descendants; that which is produced from something else.

OFFWARD, ad. *ŏf'wėrd* [*off*, and AS. *weard*, expressing direction]: in *nav.*, the situation of a ship which lies aground, and leans from the shore.

OFT: for OFTEN, which see.

OFTEN, ad. *ŏf'fn* [Icel. *opt;* Dan. *ofte;* Goth. *ufta*, often]: many times; repeatedly; not seldom. OFT, ad. *ŏft*, poetic for *often*. **OFTENTIMES**, or **OFTTIMES**, ad. frequently.

O'GAM: see OGHAM.

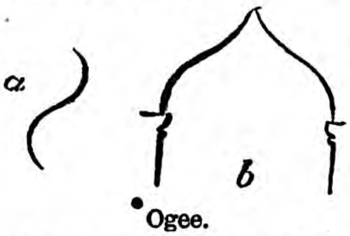
OGDEN, *ŏg'dĕn:* city, cap. of Weber co., Utah, at the union of the Ogden and Weber rivers; on the Union Pacific, the Rio Grande Western, the Central Pacific, the Utah Central, the Ogden and Syracuse, the Echo and Park City, and the Utah and Northern railroads; near the Wasatch Mountains, and 37 m. from Salt Lake City. It is on a great plain, 4,340 ft. above the ocean, 85 ft. above Great Salt Lake 6 m. distant. The city is 4 m. square, the streets cross each other at right angles, and, except the principal business thoroughfare, 132 ft., are 100 ft. wide. The streets are paved with asphalt, found in inexhaustible quantity in one of the mountains close by; they have broad walks and are well shaded. There are street railroads, light is supplied by gas and electricity, and there is a telephone service. There are 6 churches and a Mormon tabernacle; a good public-school system, various denominational schools; and the corner-stone of Utah Univ., which is to cost $500,000 and be under Meth. Episc. management, was laid 1890, Aug. 5. There are 1 monthly, 1 semi-weekly, and 3 daily newspapers; 3 national banks (cap. $400,000), 1 state bank (cap. $100,000), and 1 savings bank; an opera-house; and 6 hotels. One of the finest systems of water-works in the region is to be completed during 1890. Among the fine buildings are the Chamber of Commerce, the Union depot, municipal building, opera-house, and a hotel which cost $150,000. O. is the outlet for the products of an extensive and fertile agricultural, live-stock, and fruit-growing region, which will be increased by the largest irrigating canal in the world, on which 3,000 men are (1890) employed, which will open 500,000 acres of land to cultivation, and cost $3,000,000. The city is the centre of extensive trade. Iron, copper, lead, silver, and gold are found in the vicinity; there are enormous quantities of coal; large deposits of manganese, fire-clay, kaolin, and mineral resin; and marble, granite, and sandstone of various shades and fine qualities are found in abundance. Salt, and various sulphates, borates, and bromides are obtained from the lake, and lime from the mountains, at very small expense. The Odgen river in its passage through the cañon falls about 550 ft. in a distance of 5 m., giving immense water-power. The manufacturing interests are varied, extensive, and rapidly increasing. The largest flour-mills in the region are here; brick, tile, and pottery ware are made in great quantities. Among the manufactures are lumber, woolen and knit goods, boots, shoes, cigars, and brooms. There are also canning establishments, 2 breweries, and a vinegar factory. On account of its fine climate and remarkably equable temperature, O. has become a favorite health resort. The waters of the famous hot springs are claimed to be wonderfully efficacious in certain forms of scrofula, rheumatism, and other diseases; while bathing in Great Salt Lake is highly invigorating. O. was settled by Mormons 1848, was incorporated 1859, and has recently had wonderful growth. It is said that in a period of 18 months the pop. has more than doubled, and that $1,500,000 has been expended on private buildings within a year. Pop. (1870) 3,127; (1880) 6,069; (1890, U. S. census, first report) 14,919.

OGDEN, *ŏg'dĕn*, **Aaron**: 1756, Dec. 3—1839, Apr 19; b. Elizabethtown, N. J.; son of Robert O., colonial patriot and statesman. Aaron graduated at Princetown 1773, and afterward taught school. He served in the revolutionary war as aide-de-camp to Lord Stirling and Gen. Maxwell, and accompanied Lafayette in his Virginia campaign 1781, receiving special commendation from Washington for gallant conduct at Yorktown. After the war, he studied law, and practiced successfully in his native state; holding, meanwhile, several important military and political appointments. He was U. S. senator 1801–03 and chosen gov. of N. J. 1812, Oct. 29. In 1806 he was one of the N. J. commissioners to settle the question of boundary and jurisdiction between N. Y. and N. J. He was commander-in-chief of the N. J. militia in the war of 1812, declining the appointment of maj.gen. U. S. A. He served as trustee of Princeton 1803–12 and 1817–39, receiving the degree LL.D. from that college 1816. He was pres.general of the Soc. of the Cincinnati from 1829 till his death in Jersey City.

OG'DEN, David: 1707–1800, June; b. Newark, N. J. He graduated at Yale 1728, studied law in New-York, and became the leader of his profession in N. J. He was chosen a member of the royal provincial council, 1751, Apr., served as judge of the superior court, and 1772 was appointed a judge of the supreme court, which position he held till the outbreak of the revolutionary war. His sympathy with the mother country compelled him to seek refuge in England, 1777, Jan., and in 1779 he became an active member of the board of refugees, consisting of representatives of the several colonies, and drew up a plan for their government in the event of their surrender to Great Britain. His own estates, valued at $100,000, and those of other loyalists having been confiscated, he went to England again, 1783, to urge their claims for compensation. He returned to the U. S. 1789, having secured an allowance for his property, and settled at Whitestone, Long Island. N. Y., where he passed the remainder of his life.

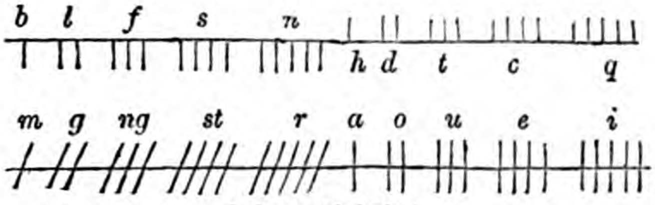
OGDENSBURG, *ŏg'dĕnz-bĕrg:* city and port of entry in St. Lawrence Co., N. Y.; on the St. Lawrence river, at the mouth of the Oswegatchie; 72 m. below Lake Ontario, and 4 m. above the rapids; it is about 175 m. n.w. of Albany, opposite Prescott, Canada, and is the terminus of the Rome Watertown and Ogdensburg, the Utica and Black River, and the Ogdensburg and Lake Chaplain railroads, the last being a division of the Vermont Central. The St. Lawrence is more than 2 m. wide at this point. Steam ferry-boats run between O. and Prescott, and O. is also headquarters for the Northern Transportation Co.'s line of 23 steamers connecting Chicago with O., and touching at other points on the great lakes. The commerce of O. is important, grain and lumber being chief sources of revenue. It has an immense grain elevator, and it is estimated that 10,000,000 bushels of grain pass through this port annually, from the west to New England. The annual lumber receipts are about 75,000,000 ft. The water-power is excellent, and is employed in the manufacture of flour, lumber, machinery, and leather. The city is level, regularly laid out, beautifully shaded, and lighted with gas; it has the Holly system of water-works. The principal public buildings are the U. S. post-office, custom-house and court-house, and the Rom. Cath. Cathedral. There are also 6 churches, 3 newspapers, a large hotel, a bank, an Educational Inst., and graded schools. O. was founded 1749, incorporated as a vill. 1817, and became a city 1868. Pop (1870) 10,076; (1880) 10,341.

OGEE, n. *ō-jē'* [F. *ogive;* It. *augivo,* the arch of a ceiling]: wave-like molding of two curves, one concave, the other convex (*a*); the union of the concave and convex in an arch or fillet; a cyma; contracted into O.G. It is called (in Classic Architecture) *Cymatium* or *Cyma Reversa* (see Molding). The ogee is much used in Gothic architecture also. An arch having each side formed with two contrasted curves, an arch with a double curve, is called an ogee arch (*b*). Figure *a* represents Hogarth's line of beauty.



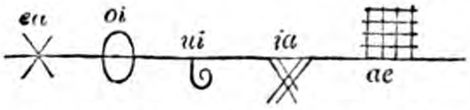
Ogee.

OGHAM, n. *ŏg'hăm*, or Ogam [Ir. *ogam* or *ogma*]: kind of shorthand writing or cipher, in use among the anc. Irish: see Celtic Nations. The name Oghams was given to the letters or signs of a secret alphabet long in use among the Irish and some other Celtic nations. Neither the origin nor the meaning of the name has been satisfactorily explained. The alphabet itself is called *Bethluisnin,* or *Bethluis,* from its first two letters, '*b,*' called '*beith*' (birch), and '*l*,' called '*luis*' (quicken). Its characters are lines, or groups of lines, deriving their significance from their position on a single stem or chief line—over, under, or through which they are drawn either straight or oblique. In some cases the edge of the stone or other substance on which the Oghams are incised serves the purpose of the stem or chief line. About 80 different forms of the alphabet are known. The following is most commonly used:



Ogham Alphabet.

These seem to have been all the letters of the first O. alphabet. Five characters were afterward added to represent diphthongs:



The sign for the diphthong '*ea*' is said to be the only one which has been observed on ancient monuments. It is added that the sign for '*ui*' sometimes stands for '*y*,' that the sign for '*ia*' sometimes stands for '*p*,' and that the sign for '*ae*' stands also for '*x*,' for '*cc*,' for '*ch*,' for '*ach*,' and for '*uch*.'

O. inscriptions generally begin from the bottom, and are read upward from left to right to the top, when they are carried over, and run down another side or angle. Most of those which have been read give merely a proper name with its patronymic, both in the genitive case. The stones on which Oghams are cut seem mostly to have been sepulchral. Oghams are most frequent in Ireland, where they are found both written on books and inscribed on stones, metals, or bones. The Oghams on stones are most numerous in the counties of Kerry and Cork. A few O. inscriptions on stones have been discovered in Wales—as at St. Dogmael's, in Pembrokeshire; near Margam, in Glamorganshire; and near Crickhowel, in Brecknockshire. There are a few in Scotland, as on the Newton Stone and the Logie Stone in Aberdeenshire, on the Golspie Stone in Sutherland, and on the Bressay Stone in Shetland. One has been found in England—at Fardel, in Devonshire. Oghams have been observed on an ancient MS. of Priscian, which belonged to the famous Swiss monastery founded in the 7th c. by the Irish missionary, St. Gall (q.v.).

The difficulties of deciphering O. inscriptions have not been fully overcome. It is confessed by the most learned and judicious of O. scholars, Charles Graves, D.D., of Trinity College, Dublin, that the nature of the character is such that it does not at once appear which, of four different ways of reading, is the right one; that the words being written continuously, as in ancient MSS., there is great chance of error in dividing them; and that the Celtic names inscribed are generally Latinized in such a manner as not readily to be recognized.

The old school of Irish antiquaries contended that the Oghams were of Persian or Phœnician origin, and were in use in Ireland long before the introduction of Christianity. But this theory is now generally discarded, as not only unsupported, but as contradicted by facts. A comparison of the O. alphabet, with the alphabets of Persepolis and Carthage, shows that there is no likeness between them. The great majority of O. monuments, it has been observed, bear more or less distinct marks of Christian hands. Several are inscribed with crosses, as old, to all appearance, as the Oghams themselves. Many stand in Christian burying-grounds, or beside Christian cells or oratories. Some still bear the names of primitive saints. At least one is inscribed with a Christian name; and some of the inscriptions show undeniable knowledge of Latin. At the same time, it has been argued by one of the most learned of Celtic philologists, Whitley Stokes, that 'the circumstance that genuine Ogham inscriptions exist both in Ireland and in Wales which present grammatical forms agreeing with those of the Gaulish linguistic monuments, is enough to show that some of the Celts of these islands wrote their language before the 5th c., the time at which Christianity is supposed to have been introduced into Ireland.' It has been observed by Dr. Graves, on the other hand, that there are many points of resemblance between the Oghams of the Celts and the Runes of the Norsemen; and one Irish MS. asserts that the Oghams came to Ireland from Scandinavia. The O. is said to have been in use so recently as the middle of the 17th c., when it was employed in the correspondence between Charles I. and the Earl of Glamorgan.

The best account of Oghams is in papers in *Transactions of the Royal Irish Academy*, by Dr. Graves, now bp. of Limerick, IV. 70, 173, 183, 254; V. 234, 401; VI. 71, 209, 248, where also are papers of value on the same subject by Samuel Fergusson; and the *Catalogue of the Museum of the Royal Irish Academy*, 134–140; and Whitley Stokes's *Three Irish Glossaries*, 55–57, compared with Thomas Innes's *Critical Essay on the Ancient Inhabitants of Scotland*, II. 440–466. See also Astle's *Origin and Progress of Writing*, Petrie's *Essay on the Round Towers of Ireland*, John Stuart's *Sculptured Stones of Scotland*, Ware's *Antiquities of Ireland*, and Brash's *Ogam-inscribed Monuments of the Gaedhil.* O. inscriptions are in the Museum of the Royal Irish Acad. at Dublin, in the Edinburgh Antiquarian Museum, and in the British Museum.

OGILBY, *ō̆'g'l-bĭ*, JOHN: 1600–1676, Sep. 4: b. Edinburgh. He went to London in early life, and eventually became a dancing-master. Under the patronage of Wentworth, Earl of Strafford, he was appointed master of the revels in Ireland. He built a theatre in Dublin, but was ruined by the civil wars, and afterward returned to England and studied at Cambridge. He published various translations in verse including one of Homer which Pope valued highly in his younger days. O. was more than 50 years of age when he took up the study of Greek for the purpose of making this translation, which was very popular, and was noted for typographical beauty. He was also appointed royal cosmographer, and published several vols. of a descriptive geography of the world. He again became master of the revels in Ireland at the restoration, but was ruined by the fire of London.

OGIVE, n. *ō-jīv'* [F.: see OGEE]: among the *French*, a pointed arch crossing another; the Gothic arch with its ribs and cross-springers, etc.

OGLE, n. *ō'gl* [Dut. *oogen*, to eye—from *ooge*, the eye: Ger. *aügeln*, to eye one slyly—from *auge*, an eye]: a side glance or look: V. to view with side glances to attract notice, or in fondness. O'GLING, imp.: N. the act of viewing with side glances. O'GLED, pp. *-gld*. O'GLER, n. *-glėr*, one who ogles.

OGLESBY, *ō'gėls-bĭ*, RICHARD JAMES: b. Oldham co., Ky., 1824, July 25. He removed to Decatur, Ill., 1836; and applied himself to the carpenter's trade, farming and making rope till 1844, studying law in the mean time. He was admitted to the bar and began practice in Sullivan, Ill.; but the next year returned to Decatur, and as 1st. lieut. of the 4th Ill. regt. served in the Mexican war, taking part in the investment of Vera Cruz and the battle of Cerro Gordo. On his return to Decatur 1847, he took a course of study at the Louisville Law School, and graduated 1848. He was employed in California mining 1849–51; and again returning to Decatur was elected to the state senate 1860, but resigned to accept the colonelcy of the 8th Ill. vols. He commanded a brigade at the capture of Forts Henry and Donelson, and for gallant conduct was promoted brig.-gen. of vols., 1862, March 21. A severe wound received at Corinth unfitted him for duty till 1863, April, but he had in the mean time been promoted to maj.gen. of vols., 1862, Nov., and placed in command of the 16th army corps. He resigned 1864, May, was gov. of Ill. 1865–69, and again elected 1872, but was chosen U. S. senator 1873, Jan. He was again gov. of Ill. 1885–89.

OGLETHORPE, *ō'g'l-thawrp*, JAMES EDWARD: 1696, Dec. 26—1785, July 1; b. London: son of Sir Theophilus O., of Godalming, Surrey. He entered Oxford 1714, but joined the army the same year, serving with distinction as aide-de-camp to Prince Eugene in the campaign against the Turks 1716–7, especially at the siege of Belgrade. He entered parliament as member for Hazlemere 1722, and became deeply interested in improving the condition of poor debtors in English prisons. Aiming not only to liberate the prisoners, but to provide an asylum for insolvent persons and for oppressed Protestants throughout Europe, he conceived the plan of establishing a colony in America between Florida and Carolina. A large sum was raised by subscription, parliament granted £10,000 (about $48,600);

and 1732, June, the king granted to O. and 20 others, the territory between the Savannah and Altamaha rivers. The tract was named Georgia in honor of the king. O. arrived at Charleston with 150 settlers, 1733, Jan., and soon afterward the foundation of Savannah was laid. (For account of O.'s colonial career, see GEORGIA.) He returned to England finally, 1743; and 1745 was appointed maj.gen. and sent against the pretender. His dubious conduct led to his court-martial 1746; but he was acquitted, and 1747 promoted lieut.gen.; he retired as gen. on half-pay 1765. He surrendered his Georgia charter to the British crown 1752, but his interest in colonial affairs was undiminished. When Gen. Gage returned to England 1775, the command of the British troops in America was offered to O., but he declined it unless he were authorized to make concessions. He was a man of more than ordinary culture, and his writings on colonial matters are of local historic value. He died at Cranham Hall, Essex, England.

OGLIO, n. *ō'lĭ-ō:* same as OLIO, which see.

OGOBAI, *ŏg'o-bā*, or OGOWÉ, *ŏg'o-wā:* large river of w. Africa, between the Gaboon and Congo, entering the sea by many mouths, 400 m. n. of the mouth of the Congo, between s. lat. 0° 40′ and 1°20′. Its delta is not less than 1,300 sq. m. in extent, and consists of a most complicated net-work of channels and creeks, with two main branches, the most northerly of which reaches the sea at Nazareth Bay; the other principal mouth, the Bango or Fernand Vaz, about 50 m. farther s., has its outlet at the lagoon of Cama or Ncomi. The researches of Du Chaillu, its first explorer, 1856 and 65; of Walker 1866 and 73; of Compiègne, Marche, and Dr. Lenz 1874, and 1875–78 of M. Savorgnan de Brazza and Dr. Ballay, have added to our knowledge of this region. About 60 m. inland, above the head of the delta, the O. flows for about 50 m. from the e., its average width about 2,500 yards. It then bends n. 15 m., and here occurs the junction of the Okanda river, from the n.e., with the Ngunie from the s.: the river is navigable from the sea to this junction. The bed of the main stream, the Okanda, is 800 to 1,000 yards wide above the confluence, with a series of rapids on its upper waters, 180 m. from the sea. In addition to a French commercial establishment on the lower river, there is a British and Hamburg station at Adelina Longa, below the Ngunie. This latter district is distinguished by numerous lakes, one of which, 15 m. long by 7 broad, is connected with the O. by three rivers. Lake Azingo, to the north, is connected with the O. by the river Koli. In 1875 M. de Brazza was at Lopé, and explored the Fan country; he then advanced to Doumé, 50 m. south of the equator, where the course of the river is from s.e. to the n.w. Interrupted by illness, he resumed his explorations 1877, Apr., advancing to the Poubara Falls, in 1° 45′ s., where the O. is an insignificant stream. Travelling eastward into unknown country, he crossed the water-parting, and discovered the Alima, a hitherto unknown river, 150 yards wide, flowing e., and in all probability a tributary of the Congo. The region between the O. and Alima is 50 m. across, and consists of hills of moderate height, with easy passes. The dense forests of the O. are the main haunts of the Gorilla (q.v.), and of several other anthropoid apes, among which are the Nest-building Apes (q.v.). South of the O. dwell the Ashira and Apingi tribes, the latter skilful weavers, though cannibals; between the O. and the Gaboon are the Fans, fully described first by Du Chaillu, who also are cannibals; and have been moving westward for some years, so that the whole Gaboon region is occupied by them. The Fans excel in smith-work, but have deteriorated since their contact with the whites. Next in importance to the Fans are the Bakalai, inhabiting the country around the confluence of the O. and the Ngunie. Among tribes on the upper waters are the Okota, Oseyba (cannibals), and the Okanda. The rise of the O. corresponds with the heaviest rainfall, which is in March and April, and again in Oct. and Nov. Inland, rain is more frequent than at the coast. The O. seems to gather most of its water from lands comparatively near the coast (200–300 m.) and not to depend greatly on more remote tributaries. The remarkable volume of its water is ascribed to its draining an extensive region under the equator where rains are in tropical abundance. Total length of the O. 500 or 600 miles.

OGRE, n. *ō'gėr* [Sp. *ogro;* F. *ogre;* O. Sp. *huergo*, the man-eating giant of fairy tales: It. *orco*, a surname of Pluto, any imaginary monster—from L. *orcus*, hell]: one of the imaginary monsters of nursery stories. **Ogress**, *ō'grĕs*, a female ogre; in *her.*, a ball or pellet of a dark color. **Ogreish**, a. *ō'gėr-ĭsh*, having the supposed character and appearance of an ogre.

OGYGES, *ŏj'ĭ-jēz* or *ō-jĭ'jēz:* earliest king of Attica and Bœotia named in Greek legend. In his time (according to Larcher, about B.C. 1759, a great flood took place, called the Ogygian Flood, which desolated all the lower districts of both countries, and destroyed their inhabitants. The different legends lead to the supposition that under O. an Egyptian colony came to Bœotia, and thence to Attica. From him Bœotia took the name of Ogygia. **Ogygia**, n. *ŏ-jĭj'ĭ-ă* [from *Ogygēs*, anc. Greek monarch whose history and reign are very obscure, hence anything dark or of doubtful origin]: genus of trilobites peculiar to the Llandello flags of the Lower Silurian period. Six species have been described. They were named in allusion to their obscure and remote origin, or from their being found in the earliest fossiliferous formations. **Ogygian**, a. *ŏ-jĭj'ĭ-ăn*, pertaining to Ogyges; term applied to the great deluge in the fabulous history of Greece: applied to anything dark, obscure, or of doubtful origin.

Ogygia Buchii.

OH, int. *ō* [see O]: an exclamation expressive of pain, sorrow, surprise, or dissent.

OHIO, *ō-hī'ō:* state; one of the United States of America; 17th in order of admission into the Union, 4th under the federal constitution; ranking (1880) 1st in agricultural implements and wool, 2d in petroleum, iron, and steel, 3d in population, wheat, sheep, coal, malt and distilled liquors, 4th in printing and publishing, salt, soap, and railroad mileage, 5th in manufactures, milch cows, hogs, horses, hay, tobacco, and iron ore; (1885) 2d in coal; (1890) 4th in population; popularly known as the 'Buckeye state.' The name Ohio is Indian, meaning 'beautiful river.'

Location and Area.—O. is in lat. 38° 23′—41° 58′ n., long. 80° 31′—84° 48′ w.; bounded n. by Mich. and Lake Erie, e. by Penn. and W. Va., s. by W. Va. and Ky., w. by Ind.; extreme length n. to s. 210 m.; extreme breadth 195 m.; Lake Erie water-front 230 m.; Ohio river water-front 436 m.; 41,060 sq. m. (26,278,400 acres); cap. Columbus.

Topography.—Nearly all the state is a table-land or elevated plateau, with average height about 1,000 ft. above sea-level, lowest 433 ft., highest 1,540 ft. The Ohio river, which falls 230 ft. in 436 m., and many of its tributaries, have cut deep valleys in this plateau, exposing steep bluffs and narrow ravines in places. The Lake Erie and Ohio river drainage areas are divided by a ridge extending n.e. to w., from Trumbull co. to Mercer and Darke cos., with average height 600 ft. above the lake. This ridge forms a watershed, from which the surface slopes n. to Lake Erie and s. to the Ohio river. Lake Erie receives the waters of the Maumee, Sandusky, Huron, Vermilion, Portage, Black, Cuyahoga, Rocky, Chagrin, Grand, Conneaut, and Ashtabula rivers; and the Ohio river those of the Mahoning, Muskingum, Scioto, Little Miami, Great Miami, Walhonding and Tuscarawas (forming the Muskingum), and the Whetstone (chief affluent of the Scioto) rivers. The Ohio river is navigable for light-draught vessels to Pittsburg, Penn.; and the Muskingum, by means of slack-water improvements, from its mouth to Dresden, 95 m. The other rivers are commercially non-navigable. The Maumee river has long been noted as one of the best fish-producing streams in America. There are good harbors at Cleveland, Sandusky, and Maumee Bay; besides lake ports at Toledo, Conneaut, Ashtabula, Black River, Fairport, Port Clinton, Vermilion, Put-in-Bay, and Huron.

Climate.—The climate, in general, is healthful; in the n. portion the winters are cold, with abundant and long-lying snow, and summers and autumns are temperate and pleasant; in the s. portion the winters are short, mild, and with little snow, and the summers are long and hot; average mean temperature n., at Cleveland, 45° 87′, and s., at Portsmouth, 55° 83′; mean annual rainfall, Cleveland 38·43 in., Portsmouth 38·32. The changes in temperature are frequent and extreme, but the constantly varying winds greatly lessen the duration of the extremes.

OHIO.

Geology.—Nearly all the formations are secondary, and include limestone, lias, saliferous and ferriferous rocks, sandstone, and gray wacke, all in horizontal strata. The oldest rock in the state is the Cincinnati limestone, of Lower Silurian age, and allied to the Trenton and Hudson groups of N. Y. It extends from the Wine Islands, in Lake Erie, into Ky., where it underlies the blue-grass region, and into Tenn.; and is composed of limestone, marl, and clay, with great variety of fossil remains. Near the Cincinnati limestone are the Clinton and Niagara limestones, the former yielding iron ores in Muskingum co., and the latter excellent lime. The Salina group, prominent at Syracuse, N. Y., is exposed at Sandusky, and bears gypsum and fine building-stones. The water-lime, developed on the Wine Islands and in the w. part of the state, supports the Oriskany sandstone. There are two belts of carniferous limestone—one extending from Sandusky into Pickaway co., the other from Toledo to Van Wert, near the Ind. line; and this limestone forms the surface-rock of Kelley's Island (q.v.). This formation yields excellent building-stone, such as the state-house was constructed with, besides lime and remains of large ganoid fishes; and is quarried at Kelley's Island, Columbus, Sandusky, Delaware, and elsewhere. Huron shale is found in the n.w. part of the state, and in a belt averaging 15 m. wide from Lake Erie to the Ohio river, and is the source of the petroleum and natural gas of Penn. and parts of O. Erie shale borders the lake-shore from Penn. to the Vermilion river. The carboniferous system underlies nearly the e. half of the state, and rests on the shales and sandstones of the Waverley group, with the Berea grit for a substratum. The latter sandstone is quarried at Amherst, Berea, Buena Vista, and Independence, for grindstones and building-purposes. The coal measures, showing strata of shale, sandstone, limestone, coal, fireclay, and iron ores, occupy the s.e. third of the state, underlie 20 cos., cover 12,000 sq. m., have a maximum thickness of 1,200 ft., and are divided into the lower (400 ft.), barren (400 ft.), and upper (300–600 ft.) measures. The lower measure contains block coal, and the upper measure 9 seams of Strawbridge cannel, cannel, Leetonia coke, and coking coals, while the barren measure contains 3 seams of only local importance. An area of nearly 12,000 m. in the s. part of the state contains the second great mineral staple, iron, representing the ores of the buhrstone stratum of the lower coal measures, considered the most important spathic ores in the United States, the black band of the barren measures, and its subordinates, mountain and kidney. Drift deposits cover nearly two-thirds of the state, and contain clay, sand, gravel, and large bowlders.

The economic properties of O. are coal, wholly in Mahoning, Columbiana, Stark, Holmes, Tuscarawas, Carroll, Jefferson, Harrison, Belmont, Guernsey, Coshocton, Muskingum, Perry, Noble, Morgan, Monroe, Washington, Athens, Meigs, Gallia, and Lawrence, and partly in Jackson, Trumbull, Portage, Geauga, Summit, Medina, Licking, Wayne, Hocking, Fairfield, Scioto, Vinton, Knox, Richland, and Ashland cos.; iron in Lawrence, Gallia, Jackson, Meigs, Vinton, Athens, Hocking, Perry, and Licking cos.; white limestone in Montgomery and adjacent cos.; petroleum in Trumbull, Lorain, Medina, and Noble cos.; hydraulic cement in Belmont, Lucas, and Auglaize cos.; the limestones and sandstones above mentioned; salt; mineral springs; and marl.

The greater part of the soil is arable. The 'Western Reserve,' in the n.e., is adapted particularly to dairying and stock-raising; the s.e. part to wool-growing; the bottom-lands of the Scioto, Miami, and Muskingum rivers to Indian corn; the Muskingum and Maumee valleys to wheat; the islands and shores of Lake Erie to viniculture; and the 'Western Reserve' and Miami valley to apples. The forests contain evergreens, pines, hemlock, tamarack, cypress, spruce, 8 varieties of oak, 3 varieties of ash, 4 varieties of maple, 4 varieties of elm, sycamore, cottonwood, 5 varieties of thorn, dogwood, ironwood, black walnut, 5 varieties of poplar, honey locust, box elder, red and black cherry, mulberries, redbud, and Ky. coffee-tree. The indigenous medicinal plants include ginseng, gentian, valerian, mandrake, cohosh, blood and snake roots, and calumba.

Zoology.—Nearly all the wild animals of the earlier time, deer, wolf, bear, raccoon, and fox, have become extinct; game-birds are abundant in season; the song-birds and birds of prey common to N. Y. and Penn. are found here also; numerous reptiles, similar to those in the Mississippi valley, are encountered; and small game is still hunted in various parts. The waters of the state are especially rich in fish. The chief rivers are stocked with trout, black bass, perch, roach, and many other fresh-water fish; and Lake Erie is prolific in the delicious lake whitefish and salmon. The principal fishing-ports are Sandusky, Toledo, Cleveland, Huron, Conneaut, Put-in-Bay, and Ashtabula; and much attention is given to the manufacture of caviare and smoked sturgeon.

Agriculture.—In 1880 the farm-lands covered 24,529,226 acres (of which 18,081,191 were improved); comprised 247,189 farms, valued, with fences and buildings, at $1,127,497,353; contained implements and machinery valued at $30,521,180; used live-stock valued at $103,707,730; cost for repairs and new buildings $4,863,063, and fertilizers $550,029; and yielded products valued at $156,777,152. The principal products were: barley 1,707,129 bushels; buckwheat 280,229; Indian corn 111,877,124; oats 28,664,505; rye 389,221; wheat 46,014,869; hay 2,210,923 tons; hops 5,510 lbs.; Irish potatoes 12,719,215 bushels; sweet potatoes 239,578; tobacco 34,735,235 lbs.; wool 25,003,756; milk 46,801,537 gallons; butter 67,634,263 lbs.; cheese 2,170,245. The live-stock comprised 736,478 horses; 19,481 mules and asses;

8,226 working oxen; 767,043 milch cows; 1,084,917 other cattle; 4,902,486 sheep; and 3,141,333 swine. The value of orchard products was $3,576,242. Among dairy products, Lorain co. yielded the most milk (5,215,722 gallons), with Ashtabula co. second (4,760,638), and Trumbull co. third (4,301,555); Stark co. the most butter (2,335,700 lbs.), with Ashtabula co. second (1,446,434), and Wayne co. third (1,371,266); and Lorain co. the most cheese (299,484 lbs.), with Trumbull co. second (225,954), and Columbiana co. third (199,000). Franklin co. had the largest number of farm horses, 13,793; Jackson co. the largest number of working oxen, 605; Ashtabula co. the largest number of milch cows, 23,008; Licking co. the largest number of sheep, 251,989; and Pickaway co. the largest number of swine, 69,429. Butler co. yielded the most barley, 566,105 bushels; Fulton the most buckwheat, 12,822; Pickaway the most Indian corn, 3,846,339; Stark the most oats, 1,074,254; Hamilton the most rye, 24,941; Seneca the most wheat, 1,446,333; Ashtabula the most hay, 61,637 tons; Clermont the most Irish potatoes, 649,829 bushels; Hamilton the most sweet potatoes, 18,625; Montgomery the most tobacco, 9,314,372 lbs.; and Hamilton the largest value of orchard products, $125,029. Official reports (1888) gave: corn, 93,018,000 bushels, 2,862,080 acres, $32,556,300 value; wheat, 28,705,000 bushels, 2,657,884 acres, $27,843,850; rye, 623,000 bushels, 49,847 acres, $361,391; oats, 33,819,000 bushels, 1,063,475 acres, $9,469,320; barley, 584,000 bushels, 26,067 acres, $373,697; buckwheat, 144,000 bushels, 11,633 acres, $100,974; potatoes, 11,925,000 bushels, 149,059 acres, $4,412,146; hay, 2,960,066 tons, 2,573,970 acres, $33,034,337; tobacco, 35,195,000 lbs., 39,105 acres, $2,745,171—total acreage of these crops 9,413,120; total value of products $110,897,186. The live-stock comprised 771,607 horses, value $62,570,402; 24,472 mules, $2,153,409; 791,316 milch cows, $19,624,637; 986,601 oxen and other cattle, $22,317,518; 3,943,589 sheep, $11,927,384; and 2,611,014 swine, $13,619,047—total farm animals 9,128,599; total value $132,212,397.

Manufactures.—O. had (1880) 20,699 manufacturing establishments, employing 152,217 males above 16 years of age, 18,563 females above 15 years of age, and 12,829 children and youths—total hands 183,609; using capital $188,939,614; paying wages $62,103,800; using materials valued at $215,334,258; and yielding products valued at $348,298,390. The chief industry, according to capital employed, was the manufacture of iron and steel, which had 134 establishments, employed capital $25,141,294, paid wages $8,265,070, materials $23,997,915, and received $34,918,360 for products. Next were agricultural implements, 156 establishments, $16,111,576 capital, $2,981,065 wages, $7,243,326 materials, $15,479,825 products. Then followed industries with $1,000,000 and more of capital: foundry and machine-shop products, 419 establishments, $12,770,649 capital, $5,105,596 wages, $8,407,972 materials, $18,242,325 products; flour and grist-mill products,

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1,380 establishments, $12,328,847 capital, $1,221,494 wages, $34,157,024 materials, $38,950,264 products; men's clothing, 647 establishments, $8,651,094 capital, $4,136,382 wages, $12,043,020 materials, $20,008,398 products; malt liquors, 163 establishments, $8,178,545 capital, $1,184,825 wages, $5,110,587 materials, $9,125,014 products; sawed lumber, 2,352 establishments, $7,944,412 capital, $1,708,300 wages, $8,896,106 materials, $13,864,460 products; slaughtering and meat-packing, 93 establishments, $5,487,682 capital, $633,044 wages, $17,173,446 materials, $19,231,297 products; distilled liquors, 37 establishments, $4,813,185 capital, $400,197 wages, $4,533,049 materials, $6,692,736 products; paper, not specified, 60 establishments, $4,804,274 capital, $839,231 wages, $3,024,068 materials, $5,108,194 products; printing and publishing, 237 establishments, $4,688,535 capital, $2,067,593 wages, $2,382,305 materials, $6,579,565 products; furniture, 412 establishments, $4,417,076 capital, $2,080,243 wages, $2,694,602 materials, $6,865,027 products; carriages and wagons, 325 establishments, $4,234,481 capital, $2,610,268 wages, $5,416,656 materials, $10,043,404 products; brick and tile, 825 establishments, $2,723,528 capital, $1,114,133 wages, $1,185,794 materials, $3,481,291 products; carriage and wagon materials, 63 establishments, $2,239,265 capital, $730,565 wages, $1,039,737 materials, $2,652,823 products; sash, doors, and blinds, 102 establishments, $2,147,537 capital, $883,910 wages, $2,429,480 materials, $4,043,844 products; tanned leather, 302 establishments, $2,022,990 capital, $373,595 wages, $3,247,592 materials, $4,357,273 products; planed lumber, 148 establishments, $1,728,551 capital, $605,926 wages, $1,773,590 materials, $2,961,567 products; stone and earthenware, 179 establishments, $1,675,055 capital, $894,322 wages, $628,273 materials, $2,106,474 products; tin, copper, and sheet-iron ware, 704 establishments, $1,456,313 capital, $699,108 wages, $1,626,346 materials, $3,230,208 products; malt, 29 establishments, $1,402,931 capital, $125,287 wages, $1,391,584 materials, $1,756,551 products; starch, 5 establishments, $1,400,000 capital, $179,030 wages, $1,099,292 materials, $1,754,710 products; cooperage, 412 establishments, $1,371,100 capital, $969,610 wages, $1,852,907 materials, $3,486,032 products; hardware, 39 establishments, $1,357,109 capital, $407,894 wages, $744,963 materials, $1,592,827 products; cigars and cigarettes, 652 establishments, $1,341,070 capital, $1,495,859 wages, $2,004,439 materials, $5,018,638 products; chewing and smoking tobacco and snuff, 26 establishments, $1,332,345 capital, $393,083 wages, $3,198,926 materials, $4,378,302 products; woolen goods, 122 establishments, $1,316,340 capital, $256,214 wages, $1,084,323 materials, $1,678,189 products; saddlery and harness, 743 establishments, $1,271,869 capital, $671,124 wages, $1,487,019 materials, $3,170,413 products; railroad and street cars, 10 establishments, $1,264,000 capital, $675,806 wages, $2,133,288 materials, $3,429,996 products; glass, 20 establishments, $1,194,850 capital, $644,-

520 wages, $459,333 materials, $1,549,320 products; boots and shoes, 51 establishments, $1,154,200 capital, $1,089,116 wages, $2,498,178 materials, $4,167,476 products; marble and stone-work, 246 establishments, $1,127,930 capital, $633,312 wages, $904,069 materials, $2,240,160 products; linseed-oil, 21 establishments, $1,123,550 capital, $143,454 wages, $1,903,103 materials, $2,381,934 products; curried leather, 251 establishments, $1,089,075 capital, $234,209 wages, $3,141,024 materials, $3,886,627 products; bakery products, 497 establishments, $1,060,131 capital, $526,678 wages, $2,440,001 materials, $3,805,506 products; and undertakers' supplies, 37 establishments, $1,043,650 capital, $376,843 wages, $667,880 materials, $1,489,926 products.

1889, Jan. 1, there were 36 tobacco factories, which used in manufacturing, during the previous calendar year, 11,105,026 lbs. of leaf, 235,164 of scraps, 410,439 of stems, 2,589,511 of licorice, 2,261,124 of sugar, and other materials, making total weight 17,396,546 lbs. The production was 11,631,736 lbs. of plug, 503,111 fine-cut chewing, 2,455,398 smoking, 14,206 snuff—total weight 14,604,451 lbs. The sales aggregated 14,372,421 lbs.; exportation 4,669; and value of revenue stamps used $1,149,793. Besides this manufactured tobacco, the various factories used 5,942,188 lbs. in making 294,871,159 cigars and 13,641,900 cigarettes. There were 31 grain and 43 fruit distilleries registered, with 25 of the first and all of the last in operation. During the year ending 1889, June 30, the fruit distilleries produced 20,972 gallons of apple brandy, 336 of peach, and 19,854 of grape—total 41,162; and 12,283,039 gallons of spirits were rectified.

Mines and Quarries.—In 1880 the value of all non-precious mineral products was $8,077,488, and the chief products were bituminous coal, 5,932,853 tons, valued at $7,629,488, and iron ore, 198,835 tons, valued at $448,000. There were 245 quarries, which employed a capital of $4,166,802, and yielded a product of 19,673,309 cubic ft., valued at $2,541,647. Of these, 119 were marble and limestone quarries, which had capital $872,102, product 11,098,583 cubic ft., value $669,723; and 126 were sandstone quarries, with capital $3,294,700, product 8,574,726 cubic ft., value $1,871,924. In 1887 the production of coal was 10,301,708 tons, giving the state the 2d rank in this industry; and in the year ending 1890, June 30, there were 71 completed furnace-stacks and a pig-iron production of 1,302,299 tons, against 548,712 tons in 1880—making O. rank 2d also in this industry. Exclusive of furnace castings, the coke and bituminous coal pig-iron (1890) was 1,280,254 tons, and the charcoal pig-iron 21,807 tons—total 1,302,061, against 547,701 in 1880. The production of Bessemer pig-iron was 526,654 tons (O. ranking 3d), of which the Mahoning valley produced 96,605 tons, the Hocking valley 29,453, and the remainder of the state 400,596. In 1890 there were 18 steel-works, which produced 446,808 tons of 2,000 lbs., against 7 works and 107,883 tons 1880; the production of Bessemer steel ingots or direct castings was 385,576 tons, against 82,811 tons 1880; and the production of open-hearth steel ingots or direct castings was 61,232 tons, against 24,712 tons 1880.

Commerce.—In 1880 O. had 236 steam-vessels, 73,524 tonnage, $3,612,700 value; 196 sailing-vessels, 56,275 tonnage, $1,406,875 value; 361 canal-boats, 21,660 tonnage, $361,000 value; 165 barges, 58,153 tonnage, $114,600 value; and 238 flats, 36,930 tonnage, $61,225 value—total craft 1,196, tonnage 246,542, value $5,556,400. 1889, June 30, there were enrolled in the U. S. customs districts of Cuyahoga, Sandusky, Miami, and Cincinnati, 332 steam-vessels, 176,889 tonnage; 162 sailing-vessels, 77,740 tonnage; and 3 barges, 725 tonnage—total craft 497, tonnage 255,354. Of these, 486 were permanently and 4 temporarily enrolled, and 7 were licensed. During the fiscal year 1888–9 there entered the dists. of Cuyahoga, Miami, and Sandusky, 682 American vessels of 39,066 tons, and 692 foreign vessels of 179,082 tons—total vessels 1,372, tonnage 218,148. The clearances were 825 American vessels of 103,169 tons, and 814 foreign vessels of 183,737 tons—total vessels 1,639, tonnage 286,906. There were built in the various customs dists. 36 steam-vessels of 26,020 net tons, and 2 sailing-vessels of 70 net tons. The imports of merchandise were: Cuyahoga dist., $621,081; Miami, $116,789; Sandusky, $138,744; Cincinnati, $2,322,638; and Columbus, $15,277—total $3,214,529; and the domestic exports were: Cuyahoga, $506,385; Miami, $1,067,810; and Sandusky, $88,444—total $1,662,639. O. had 5 U. S. customs dists.; 3 lake ports of entry, Toledo, Sandusky, and Cleveland; 2 interior ports, Cincinnati and Columbus; and 4 U. S. internal-revenue dists., with stations at Cincinnati, Toledo, Portsmouth, and Cleveland. The internal-revenue receipts for the year were: on distilled spirits $7,222,168; tobacco $2,307,435; fermented liquors $1,976,483; oleomargarine $58,060; penalties $2,324—total $11,566,579.

Railroads and Canals.—The first railroad in the state, the Mad River railroad, was begun 1835 and completed (36 m.) 1842. Since then the development has reached (1851) 572; (1861) 3,024; (1871) 3,457; (1881) 5,840, taxable valuation $83,764,315, stock and debt $380,709,530; (1885) 7,124; (1887) standard gauge 6,725, double track 620, narrow gauge 619—total 7,964, proportion of stock and debt in O. $536,189,382, average cost per m. $73,272, stock and debt per m. $72,335, gross earnings, passenger $25,495,598, freight $78,889,473, mail $2,826,679, express $2,119,892, other sources $3,215,100—proportion of gross earnings in O. $56,785,652, operating expenses $37,980,580, passengers 34,378,926, tons of freight hauled 85,739,801; (1889) main track 7,383, second track 575, branches 351, sidings 2,203—total 10,512. The state is traversed by a number of the great trunk-lines of the country, notably by the Ohio Central, the Lake Shore, the New York Chicago and St. Louis, the Marietta and Cincinnati, the Cleveland and Pittsburg, the Cleveland Columbus Cincinnati and Indianapolis, and the Pittsburg Fort Wayne and Chicago railroads, and other local lines operated by large companies like the Baltimore and Ohio, the Atlantic and Great Western, the Chicago and Canada Southern, and the Pennsylvania. Internal and interstate traffic is greatly promoted also by Lake Erie, the Ohio and other navigable rivers, and an admirable system of canals constructed chiefly before the era of extensive railroad-building. The first canal, the Ohio and Erie, connecting Cleveland, on Lake Erie, with Portsmouth, at the junction of the Scioto with the Ohio river, 309 m., was begun 1825, and cost $4,695,204. This has 22 m. of feeders and side cuts. The next largest is the Miami and Erie, connecting Toledo, on Lake Erie, with Cincinnati, on the Ohio river, 246 m., which cost $7,463,694. This canal is connected by a branch, 18 m., with the Wabash and Erie canal, on the Ind. state line. The Muskingum river improvement, between Marietta and Dresden, affords 95 m. of artificial navigation. There are 36 m. of feeders and side cuts, St. Mary's reservoir, 11 m., the Muskingum improvement, 654 m. of main canal, and a total of 796 m. of canal navigation. The last canal was completed 1844, and all had then cost $14,688,666.

Religion.—The Meth. Episc. Church reported (1889): *Central O. Conference*, dists. of Bellefontaine, Defiance, Delaware, Findlay, Lima, and Toledo: 176 local and 170 travelling preachers, 381 churches, 38,821 members, 396 Sunday-schools, 5,804 officers and teachers, 41,212 scholars, church property $1,255,130, and 106 parsonages, value $166,310. *E. O. Conference*, dists. of Akron, Barnesville, Cambridge, Canton, Cleveland, New Philadelphia, Steubenville, and Youngstown: 177 local and 258 travelling preachers, 526 churches, 56,722 members, 530 Sunday-schools, 7,546 officers and teachers, 52,184 scholars, church property $2,196,758, and 131 parsonages, value $240,720. *N. O. Conference*, dists. of Cleveland, Galion, Mansfield, Mt. Vernon, Sandusky, and Wooster: 86 local and 172 travelling preachers, 309 churches, 30,217 members, 311 Sunday-schools, 4,488 officers and teachers, 30,568 scholars, church property $1,090,082, and 95 parsonages, value $152,750. *O. Conference*, dists. of Chillicothe, Columbus, Gallipolis, Lancaster, London, Marietta, Portsmouth, and Zanesville: 179 local and 192 travelling preachers, 547 churches, 59,386 members, 576 Sunday-schools, 7,286 officers and teachers, 52,264 scholars, church property $1,458,995, and 123 parsonages, value $199,930. In *Central German Conference*, dists. of Cincinnati and N. O.: 46 local preachers, 84 churches, 7,021 members, 84 Sunday-schools, 1,179 officers and teachers, 7,186 scholars, church property $426,000, and 35 parsonages, value $77,800. *Cincinnati Conference*, dists. of Cincinnati, Dayton, Hamilton, Hillsborough, Ripley, and Springfield: 148 local and 177 travelling preachers, 365 churches, 46,346 members, 361 Sunday-schools, 5,505 officers and teachers, 38,711 scholars, church property $1,895,200, and 105 parsonages, value $273,600. *Total:* 6 conferences, 36 dists., 812 local and 969 travelling preachers, 2,212 churches, 238,513 members, 2,258 Sunday-schools, 31,808 officers and teachers, 222,125 scholars, church property $8,322,165, and 595 parsonages, value $1,111,110.

The Rom. Cath. Church reported (1890): *Archdiocese of Cincinnati* (see erected 1821, made archbishopric 1850): 1 abp., 226 priests, 196 churches, 35 chapels and stations, 2 seminaries, 3 colleges for boys, with 655 pupils, 2 boarding-schools for boys, with 280 pupils, 9 academies for young ladies, with 740 pupils, 89 parochial schools, with 10,888 boys and 10,976 girls, 4 hospitals, 2 orphanages, 2 homes for the poor, 1 protectory for boys, and estimated Rom. Cath. pop. 189,500. *Diocese of Cleveland* (established 1847): 1 bp., 208 priests, 229 churches, 94 chapels and stations, 1 seminary, 3 educational institutions for boys, 5 academies for young ladies, 127 parochial schools, with 26,492 pupils, 5 hospitals, 6 orphanages, 1 protectory for girls, 1 reformatory for girls, 3 homes for aged poor, 6 male and 18 female religious communities, and estimated Rom. Cath. pop. 209,325. *Diocese of Columbus* (established 1868): 1 bp., 88 priests, 94 churches, 37 chapels and stations, 2 orphanages, 3 academies for young ladies, 37 parochial schools, with 7,332 pupils, 1 male and 5 female religious communities, 2 hospitals, and estimated Rom. Cath. pop. 54,000. *Total:* 1 abp., 2 bps., 522 priests, 519 churches, 166 chapels and stations, 253 parochial schools, with 55,688 pupils, 3 seminaries, 3 colleges, 32 academies, 35 charitable institutions, and estimated Rom. Cath. pop. 452,825.

The Presb. Church in the U. S. of Amer. reported in O. (1890): 1 synod; 17 presbyteries; 492 ministers; 617 churches; 81,095 members; 608 Sunday-schools; 9,624 officers and teachers; 78,968 scholars; 88,592 Sunday-school members; and $819,182 contributions for congregational purposes.

The Baptists reported (1890): 1 convention; 32 associations; 475 ministers; 630 churches; 53,384 members; 555 Sunday-schools; 6,406 officers and teachers; 49,177 scholars; church property $2,384,825; and contributions $404,761.

The Prot. Episc. Church reported (1890): *Diocese of O.* (organized 1818): 1 bp.; 64 clergy; 93 parishes and missions; 8,341 communicants; 893 Sunday-school teachers; 7,455 scholars; 5 educational institutions; contributions $186,486. *Diocese of S. O.* (organized 1875): 1 bp.; 43 clergy; 64 parishes and missions; 7,475 communicants; 619 Sunday-school teachers; 5,248 scholars; 3 institutions; contributions $168,171. *Total:* 2 bps.; 107 clergy; 157 parishes and missions; 15,816 communicants; 1,512 Sunday-school teachers; 12,703 scholars; 8 institutions; and $354,657 contributions.

The Congl. Churches reported (1889): 215 ministers; 236 churches; 16,026 families; 29,581 members; 32,080

Sunday-school members; and $253,180 contributions for home expenses, from 225 churches.

The Meth. Prot. Church reported (1890): 54 itinerant and 11 local ministers and preachers; 98 churches; 6,959 members; 91 Sunday-schools; 1,096 officers and teachers; 6,190 scholars; 28 parsonages; and church property $181,250.

The Universalist Church reported (1890): 89 parishes; 83 churches; 2,604 families; 4,916 members; 62 Sunday-schools; 3,976 scholars; 1 college (Buchtel); and church property $316,710.

The Free-Will Bapt. Church reported (1890): 4 yearly meetings; 75 ministers; 107 churches; and 6,539 members.

The last available report of the Lutheran Church showed: 320 ministers; 572 churches; and 70,500 members.

At the sixth international Sunday-school convention, at Pittsburg, 1890, June 24–27, there were reported in O. 6,760 Sunday-schools, 88,461 officers and teachers, and 620,107 scholars—total members 708,568.

Education.—In 1880 O. had 1,043,320 children of school age (6–21 years), of whom 752,442 were enrolled in public schools, and 495,924 were in average daily attendance. The total cost of maintaining the public schools was $7,707,630, of which $4,972,541 were appropriated for teachers' salaries. There were 35 universities and colleges, with 348 instructors and 5,694 students. The institutions (10) for superior instruction of women (1887–8) were: Bartholomew English and Classical School, at Cincinnati, opened 1875 (Prot. Episc.); Wesleyan College, Cincinnati, 1842 (Meth. Episc.); Mt. Auburn Young Ladies' Institute, Cincinnati, 1856 (non-sect.); Female College, Glendale, 1854 (Presb.); Female College, Granville, 1827 (Presb.); Shepardson College, Granville, 1887 (Bapt.); Female College, Hillsborough, 1839 (Meth. Episc.); Female College, Oxford, 1849 (Presb.); Western Female Seminary, Oxford, 1855 (Presb.); and Lake Erie Female Seminary, Painesville, 1859 (non-sect.). These combined had 118 instructors, 1,055 students, 16,000 volumes in the libraries, scientific apparatus valued at $3,600, grounds and buildings $961,134, productive funds $132,880, income therefrom $26,274, tuition fees $49,138, all sources excepting board and lodging $28,736, and benefactions $25,100.

The colleges of liberal arts (33) were: Buchtel College, Akron, chartered 1870 (Univ.), O. Cone, D.D., pres.; Ashland College, Ashland, 1878 (United Breth.), David Bailey, pres.; Ohio Univ., Athens, 1804 (non-sect.), Charles W. Super, PH.D., pres.; Baldwin Univ., Berea, 1856 (Meth. Episc.), J. E. Stubbs, pres.; German Wallace College, Berea, 1864 (Meth. Episc.), William Nast, D.D., pres.; Calvin College, Brooklyn Village, opened 1873 (Ref.), H. J. Ruetenik, D.D., pres.; St. Joseph's College, Cincinnati, 1871 (Rom. Cath.), Rev. James Rogers, C.S.C., pres.; St. Xavier College, Cincinnati, 1831 (Rom. Cath.), Rev.

Henry A. Schapman, S.J., pres.; Univ. of Cincinnati, chartered 1870 (non-sect.), Jacob D. Cox, LL.D., pres.; Adelbert College of Western Reserve Univ., Cleveland, 1826 (Congl. and Presb.), Charles F. Thwing, D.D., pres. elect; Belmont College, College Hill, 1846 (non-sect.), P. V. N. Myers, pres.; Capital Univ., Columbus, 1870 (Luth.), M. Loy, D.D., pres.; Ohio State Univ., Columbus, 1870 (non-sect.), William H. Scott, LL.D., pres.; Ohio Wesleyan Univ., Delaware, 1844 (Meth. Episc.), Charles H. Payne, D.D., LL.D., pres.; Findlay College, Findlay, 1882 (Christ.), J. R. H. Tatchaw, pres.; Kenyon College, Gambier, 1824 (Prot. Episc.), William B. Bodine, D.D., pres.; Twin Valley College, Germantown, 1886 (non-sect.), Orvon G. Brown, pres.; Denison Univ., Granville, 1831 (Bapt.), Galusha Anderson, D.D., LL.D., pres.; Hiram College, Hiram, 1867 (Christ.), Colman Bancroft, M.S., pres.; Marietta College, Marietta, 1835 (non-sect.), John Eaton, PH.D., LL.D., pres.; Mt. Union College, Mt. Union, 1846 (Meth. Episc.), G. W. Clarke, act'g pres.; Muskingum College, New Concord, 1837 (United Presb.), Rev. John D. Irons, pres.; Oberlin College, Oberlin, 1833 (Congl.), James H. Fairchild, D.D., pres. (resigned 1889); Miami Univ., Oxford, 1809 (non-sect.), R. W. McFarland, LL.D., pres.; Rio Grande College, Rio Grande, 1875 (Free-Will Bapt.), John M. Davis, pres.; Scio College, Scio, 1866 (Meth. Episc.), Rev. G. B. Smith, PH.D., pres.; Wittenberg College, Springfield, 1845 (Luth.), S. A. Ort, D.D., pres.; Heidelberg College, Tiffin, 1850 (Ref.), G. W. Williard, D.D., LL.D., pres.; Urbana Univ., Urbana, 1850 (New Church), Thomas F. Moses, M.D., pres.; Otterbein Univ., Westerville, 1847 (United Breth.), Henry Garst, D.D., pres.; Wilmington College, Wilmington, 1870 (Friends), James B. Unthank, M.S., pres.; Univ. of Wooster, Wooster, 1866 (Presb.), Rev. Sylvester F. Scovel, pres.; and Antioch College, Yellow Springs, 1852 (non-sect.), Daniel A. Long, D.D., LL.D. These combined had 444 professors and instructors, 7,276 students, 31 endowed professorships, 88 state and 295 other scholarships, 266,723 vols. in libraries, scientific apparatus valued at $331,050, grounds and buildings $4,479,686, productive funds $4,502,386, income therefrom $379,709, tuition fees $235,273, income from all sources excepting board and lodging $805,659, and benefactions $455,072. The Ohio State Univ., at Columbus, had 26 professors and instructors, 298 male and 45 female students, 4 years' college course, 8,300 vols. in library, scientific apparatus valued at $70,000, grounds and buildings $800,000, permanent productive funds $537,841, income therefrom $32,270, state appropriation $19,400, tuition fees $5,865, and income from all sources excepting board and lodging $82,100.

There were (1887–8) three schools of science not endowed with the national land grant: Industrial and Art School of the Ohio Mechanics' Institute, Cincinnati, opened 1856, R. E. Champion, pres., 12 instructors and 505 students; Technical School of Cincinnati, 1886, George R. Carothers, supt., 5 instructors and 64 students; and the Case School of Applied Science, Cleveland, 1881, Cady Staley, PH.D., pres., 9 instructors and 52 students. The schools of theol. (11) were: Theol. Dept. of German Wallace College; Hebrew Union College, Cincinnati, chartered 1873, Isaac M. Wise, pres.; Lane Theol. Seminary, Cincinnati, 1828 (Presb.), Henry P. Smith, D.D., pres.; St. Mary's Theol. Seminary, Cleveland, 1849 (Rom. Cath.), N. A. Moes, D.D., pres.; German Lutheran Seminary, Columbus, 1830, Rev. M. Loy, pres.; Union Biblical Seminary, Dayton, 1871 (United Breth.), G. A. Funkhouser, D.D., pres.; Theol. Seminary of the Prot. Episc. Church in the Diocese of O., Gambier, 1824, Fleming James, D.D., dean; Dept. of Theol., Oberlin College (Congl.); Wittenberg Seminary, Springfield; Heidelberg Theol. Seminary, Tiffin, David Van Horne, pres.; and United Presb. Theol. Seminary of Xenia, 1794, James Harper, D.D., president. These combined had 65 instructors, 530 students, 24 scholarships, 46,200 vols. in libraries, grounds and buildings valued at $705,000, productive funds $661,009, income from all sources excepting board and lodging $80,456, and benefactions $50,600. There were 9 schools of medicine, regular: Cincinnati College of Medicine and Surgery, chartered 1851; Medical College of Ohio, Cincinnati, 1819; Miami Medical College, Cincinnati, 1852; Medical Dept. of the Univ. of Wooster, Cleveland, 1864; Medical Dept. of Western Reserve Univ., Cleveland, 1842; Columbus Medical College, 1875; Starling Medical College, Columbus, 1847; Northwestern Ohio Medical College, Toledo, 1883; and Toledo Medical College, 1883. These had 150 instructors, 745 students, 3,100 vols. in libraries, scientific apparatus valued at $3,600, and grounds and buildings $489,500. There were also two eclectic schools: American Eclectic Medical College, Cincinnati, 1879, and Eclectic Medical Institute, Cincinnati, 1845, aggregating 23 instructors and 267 students; two homœopathic schools: Pulte Medical College, Cincinnati, 1871, and Homœopathic Hospital College, Cleveland, 1849, aggregating 25 instructors and 157 students; one dental school: Ohio College of Dental Surgery, Cincinnati, 1844, with 13 instructors and 126 students; and one pharmaceutical school: Cincinnati College of Pharmacy, 1850, with 6 instructors and 125 students. Public normal schools were maintained at Athens, Cincinnati, Cleveland, Dayton, and Geneva, which combined had 33 instructors and 350 pupils in the teachers' training course, and 418 pupils in the practice course; and there were private normal schools, all connected with colleges, at Defiance, Tremont city, Wadsworth, Wauseon, and Woodville, which had 34 instructors and 602 pupils in the training course. Besides these, there were the Training Class of the Free Kindergarten Assoc., Cincinnati, and the Free Normal Kindergarten Class, Cleveland, which had 2 instructors and 32 pupils; and 253 Rom. Cath. parochial schools, with 55,688 pupils.

Excluding libraries connected with colleges, schools, and school systems, and all others containing less than 1,000 vols., there were in O. (1886–7) 65 libraries, which had 652,798 vols., divided as follows: free public lending 18, vols. 344,342; free public reference 5, vols. 79,705; free corporate lending 6, vols. 22,422; soc., assoc., and club 14, vols. 125,194; and subscription corporate 22, vols. 81,135.

In 1890, Jan., there were reported 1,043 newspapers and periodicals, of which 102 were daily publications, 6 tri-weekly, 20 semi-weekly, 740 weekly, 4 biweekly, 17 semi-monthly 145 monthly, 2 bimonthly, and 7 quarterly.

Illiteracy.—Persons 10 years old and upward enumerated (1880) 2,399,367, unable to read 86,754, unable to write 131,847, whites unable to write 115,491; foreign-born whites enumerated 386,670, unable to write 32,308; whites 10–14 years old enumerated 358,269, unable to write 12,466, males 7,230, females 5,236; whites 15–20 years old enumerated 392,752, unable to write 10,409, males 5,930, females 4,479; whites 21 years old and upward enumerated 1,588,507, unable to write 92,616, males 40,373, females 52,243; colored persons 10 years old and upward enumerated 59,839, unable to write 16,356; colored 10–14 years old enumerated 9,164, unable to write 925, males 489, females 436; colored 15–20 years old enumerated 9,735, unable to write 1,279, males 691, females 588; colored 21 years old and upward enumerated 40,940, unable to write 14,152, males 7,041, females 7,111.

Finances and Banking.—In 1880 O. had a net state debt of $5,735,000 (bonded $6,476,805, sinking fund $741,805); co., township, and school-district $4,576,669; city and town $38,444,785—total $43,021,454; and an assessed real and personal valuation of $1,534,360,508. 1889, Nov. 15, the state debt, all funded, was $2,796,665, and the state held in trust funds for school purposes $4,584,180; the receipts of the fiscal year then closed were $5,947,905; expenditures $5,685,970; real and personal valuation $1,754,197,344; state tax $4,734,010; total taxes $35,974,234; and dog tax $202,457; tax rate 27 cts. on $100. The funded debt of the state was decreased during the year by $250,000, and the local debts increased by $3,448,097. 1890, Sep., there were 237 national banks (cap. $40,201,180); 57 state banks (cap. of those reporting $5,323,389); 15 incorporated banks, nearly all for savings (cap. $695,000); and 246 private banks. There were 52 fire insurance companies, with cap. (of those reporting) $3,900,000, and assets $17,093,702.

History.—The territory and vicinity of the present state of O. were inhabited at one time by tribes of Indians who exhibited in their mounds and fortifications a higher state of intelligence than did almost any other tribe of which memorials or definite information has been preserved. The mounds that they erected in the valley of the Scioto river attracted the attention of the American archæologists, Ephraim George Squier and

Edwin Hamilton Davis, M.D., and their work 1836–47 was greatly encouraged by Daniel Webster, who regretted the rapid disappearance of these antiquities. Nearly 100 groups of earthworks were surveyed and about 200 mounds were opened at the expense of Squier and Davis, the results forming the largest collection of mound relics ever made in the United States. Had Webster's suggestion been adopted, that a society be formed to purchase and preserve what he believed to be the most remarkable works of the mound-builders, this unique collection would never have been permitted to leave the country and become a distinct feature of the Blackmore Museum in Salisbury, England. A subsequent collection is preserved in the American Museum of Natural History in Central Park, New York. An account of the first explorations, prepared by Squier, forms the first vol. of the *Smithsonian Contributions to Knowledge* (1848), under the title, *Ancient Monuments of the Mississippi Valley.* It is believed that the Indians who built these mounds were succeeded by other and entirely distinct tribes, resembling in many essentials the contemporary Indians in N. Y. and Penn., and that it was this second family that La Salle met 1680, when he made the first white man's exploration on record in this region. His party established numerous trading-posts through the O. valley; and though there is no evidence to indicate that they then attempted any permanent settlements, the French govt. claimed possession of the region because of the nationality of the explorers. Counter-claims were made by the English, based on cessions by James I. to Va. (1611), of all the present territory of O. s. of lat. 41° n., and by Charles II. to Conn. (1662), of all the territory north of that line. Under these claims, surveyors were sent out, posts for trade with the Indians were established, and a number of settlements were planted. Jealousies between the French and English soon sprang up; the French commandant at Detroit warned all English settlers to retire from the region n. of the Ohio river 1749; the English failed to dislodge the French in the war 1755; and the French held possession till the treaty of Paris 1763 gave to Great Britain all the territory held or claimed by France in the n. and w., as far as the Mississippi river. After the close of the revolutionary war, this whole territory was claimed in parcels by Va., Conn. (quoting the above cessions), Mass., and N. Y.; and the disputes were settled (1800) by each claimant ceding to the federal govt. its alleged rights in the great tract, excepting that Va. and Conn. reserved the ownership of about 3,700,000 acres each, the tract of Va. including the region of the falls of the Ohio, and now forming part of Ind., and that of Conn. becoming known as the 'Western Reserve.' In 1788, Apr., a colony from New England founded Marietta, and, in Dec. following, a settlement was made on the site of Cincinnati. Indian depredations retarded the development of the territory 1792–99. In the latter year the federal govt. organized the whole region as the

Northwest Terr.; 1800, May 7, the terr. of O. was organized; 1802, Nov. 29, the first state constitution was adopted; and 1803, Feb. 19, the state was admitted to the Union. The state capital was Chillicothe 1800–10, Zanesville 1810–12, Chillicothe 1812–16, and Columbus since. The first constitution was in force till 1851, when an amended one was ratified; and this is still the law of the state, a new constitution framed 1873 being rejected by the people 1874. The movement 1821 for internal improvements, which resulted in the construction of the state canals and the early railroads, made the state accessible from all important points, and marked the real beginning of its prosperity. Geological surveys were made 1837–8, 1869, and 1874. During the war with England 1812–14, O. was concerned in Com. Perry's great victory over the British at Put-in-Bay, Lake Erie; and during the civil war the state was twice raided by the Confederates, and it furnished 313,180 men for the Union armies.

Government.—The executive authority is vested by the constitution (1851) in a gov., elected for two years, salary $8,000 per annum; lieut.gov., elected at the same time and for the same term; sec. of state; treas.; atty.gen.; auditor; adjt.gen.; commissioner of common schools; supt. of insurance; sec. of agriculture; and commissioner of labor statistics—all but the auditor (four years) being elected for two years. The gov. has a very limited power of appointment, and has no veto power on the acts of the legislature. The lieut.gov. is, *ex officio*, pres. of the senate, has a casting vote only, and succeeds the gov. in case of the death, resignation, impeachment, or other disability of the latter. All vacancies in offices below that of lieut.gov. may be filled by appointment by the gov., till the next general election. The legislative authority is vested in a general assembly, comprising a senate of 36 members and a house of representatives of 114 members, each elected for two years, salary $600 per annum and 12 cts. mileage. The constitution empowers the legislature to redistrict the state every 10 years from 1851. The assembly cannot grant special charters to corporations, but may provide for their creation by general laws. The constitution provides for biennial sessions; but adjourned sessions have been held in recent years, which made the meetings practically annual. In the election 1889, an amendment was adopted fixing the sessions as formerly provided. The judicial authority is vested in a supreme court of 5 judges, elected for 5 years, so classified that the term of one expires each year; a dist. court of one judge of the supreme court and the judges of the court of common pleas for the dist. in which the court is held; a court of common pleas originally composed of 3 judges, elected for 5 years, in each of the 9 districts into which the state was divided; a probate court of one judge, elected for 3 years, in each county; superior courts established under constitutional authority in certain large cities; local police courts; and justices of the peace. The common law of England is the basis of the civil law in the state, the criminal law is wholly statutory, there are no offenses recognized as common-law offenses, and there is no formal distinction between actions at law and in equity. There were (1889, Dec. 21) 3,008 post-offices in O., of which 7 were first-class, 45 second, 100 third, 152 presidential, 2,856 fourth, 550 money-order, 8 money-order stations, and 35 postal-note offices.

The successive govs., with their terms of service, are as follows: *Terr.*—Arthur St. Clair 1788–1802; C. W. Byrd (act'g) 1802–3. *State*—Edward Tiffin 1803–07; Thomas Kirker (act'g) 1807–8; Samuel Huntington 1808–10; Return J. Meigs 1810–14; Othniel Looker (act'g) 1814; Thomas Worthington 1814–18; Ethan Allen Brown 1818–22; Allen Trimble (act'g) 1822; Jeremiah Morrow 1822–26; Allen Trimble 1826–30; Duncan McArthur 1830–32; Robert Lucas 1832–36; Joseph Vance 1836–38; Wilson Shannon 1838–40; Thomas Corwin 1840–42; Wilson Shannon 1842–44; T. W. Bartley (act'g) 1844; Mordecai Bartley 1844–46; William Bebb 1846–49; Seabury Ford 1849–50; Reuben Wood 1850–53; William Medill 1853–4; William Medill 1854–56; Salmon P. Chase 1856–60; William Dennison 1860–62; David Tod 1862–64; John Brough 1864–5; C. Anderson (act'g) 1865–6; Jacob D. Cox 1866–68; Rutherford B. Hayes 1868–72; Edward F. Noyes 1872–74; William Allen 1874–76; Rutherford B. Hayes 1876–7; Thomas L. Young 1877–8; Richard M. Bishop 1878–80; Charles Foster 1880–84; George Hoadley 1884–86; Joseph B. Foraker 1886–90; James E. Campbell 1890–92.

Counties, Cities, and Towns.—O. was divided (1890) into 88 counties. In 1880 the most populous counties were: Hamilton 313,374; Cuyahoga 196,943; Franklin 86,797; Montgomery 78,550; Lucas 67,377; Stark 64,031; Muskingum 49,774; Belmont 49,638; Columbiana 48,602; Trumbull 44,480; Summit 43,788; Washington 43,244; Mahoning 42,871; Butler 42,579; Clark 41,498; and Darke 40,496. The leading cities and towns were: Cincinnati 255,139; Cleveland 160,146; Columbus 51,647; Toledo 50,137; Dayton 38,678; Springfield 20,730; Zanesville 18,113; Akron 16,512; Sandusky 15,838; Youngstown 15,435; Canton 12,258; Hamilton 12,122; Steubenville 12,093; Portsmouth 11,321; Chillicothe 10,938; Mansfield 9,859; Newark 9,600; Ironton 8,857; Fremont 8,446; Bellaire 8,025; Tiffin 7,879; Lima 7,567; Xenia 7,026; Delaware 6,894; Massillon 6,836; Urbana 6,252; Circleville 6,046; Wooster 5,840; Norwalk 5,704; Galion 5,635; Marietta 5,444.—The first estimate of the U. S. census 1890 gave pop. of Cincinnati 296,309; Cleveland 261,546; Columbus 114,000; Toledo 82,652; Dayton 58,868; Youngstown 33,199; Springfield 32,135; Akron 27,702; Canton 26,327; Sandusky 19,234; Findlay 18,674; Hamilton 17,519; Lima 15,970; Mansfield 13,542; Steubenville 13,363; Tiffin 10,978; E. Liverpool 10,947; Massillon 10,068; Piqua 9,069; Ashtabula 8,316; Marietta

8,308; Xenia 8,145; Defiance 7,681; Middletown 7,673; Alliance 7,598; Norwalk 7,268; Fremont 7,140; Urbana 6,499; Warren 6,086; Wooster 6,050; Bucyrus 5,951; Kenton 5,648; Van Wert 5,548; and Greenville 5,539.

Politics.—State and congressional elections are held on Tuesday after the first Monday in Nov. Every male citizen of the United States, 21 years of age, who has resided in the state one year, and in the county, township, or ward such period as may be fixed by law, next preceding election, is entitled to vote; and idiots, insane, and unpardoned felons are excluded from voting. The state govt. (1890) was democratic in gov., adjt.gen., and legislature, and republican in all other state officers; democratic majority in senate 2, house 6, joint ballot 8. O. has 23 electoral votes. Her votes for pres. and vice-pres. have been as follows: 1804, Thomas Jefferson and George Clinton 3; 1808, James Madison and John Langdon; 1812, James Madison and Elbridge Gerry 7; 1816, James Monroe and Daniel D. Tompkins 8; 1820, James Monroe and Daniel D. Tompkins; 1824, Henry Clay and Nathan Sanford 16; 1828, Andrew Jackson and John C. Calhoun; 1832, Andrew Jackson and Martin Van Buren 21; 1836, William Henry Harrison and Francis Granger; 1840, William Henry Harrison and John Tyler; 1844, Henry Clay and Theodore Frelinghuysen 23; 1848, Lewis Cass and William O. Butler; 1852, Franklin Pierce and William R. King; 1856, John C. Fremont and William L. Dayton; 1860, Abraham Lincoln and Hannibal Hamlin; 1864, Abraham Lincoln and Andrew Johnson 21; 1868, U. S. Grant and Schuyler Colfax; 1872, U. S. Grant and Henry Wilson 22; 1876, Rutherford B. Hayes and William A Wheeler; 1880, James A. Garfield and Chester A. Arthur; 1884, James G. Blaine and John A. Logan 23; 1888, Benjamin Harrison and Levi P. Morton.

Population.—(1800) white 45,028, colored 337, total 45,365; (1810) white 228,861, colored 1,899, total 230,760; (1820) white 576,572, colored 4,723, total 581,295; (1830) white 928,329, colored 9,574, total 937,903; (1840) white 1,502,122, colored 17,345, total 1,519,467; (1850) white 1,955,050, colored 25,279, total 1,980,329; (1860) white 2,302,808, colored 36,673, total 2,339,511; (1870) white 2,601,946, colored 63,213, total 2,665,260; (1880) white 3,117,920, colored 80,142, total 3,198,062; (1890, U. S. census, first report) 3,666,719.

OHI'O River: large stream, flowing from the Allegheny Mountains to the Mississippi river. It was discovered by La Salle and his followers in their exploring expedition 1669, and probably received from them the name *La belle rivière*—the beautiful river—by which it was afterward called by the French settlers. They floated down the river in canoes as far as the falls at the present site of Louisville, but returned north without determining whether the stream finally found its way to the Pacific Ocean, as they thought was probable, or was turned from its westward course and continued to the Gulf of Mexico. The river is formed by the Allegheny and Monongahela rivers, which unite at Pittsburg. It pursues a winding w.s.w. course till it reaches Cairo, Ill., where it empties into the Mississippi, a distance of only 615 m. in a straight line, but of 975 m. by its circuitous route. The Allegheny, with a course of between 300 and 400 m., is the upper stream of the O., and should be included in the measurement, making the total length of the stream about 1,300 m. Though not the longest of the tributaries to the Mississippi, it discharges the greatest volume of water. The Monongahela rises in W. Va. and flows n. nearly 300 m. The Allegheny rises in Potter co., in the n. part of Penn., in the elevated region which turns part of its waters to the St. Lawrence and part to the Gulf of Mexico, and after passing into N. Y., returns to Penn. and after many deviations reaches the point of junction with the Monongahela. The main Ohio river drains an area variously estimated at 202,400 to 214,000 sq. m., including the states of W. Va., Ky., and Tenn., and portions of nine other states. At Pittsburg the river is 1,021 ft. above sea-level. It has a mean fall of ·72 of a ft. per mile, and at Cairo has an elevation of 322 ft. The onward course of the current ranges from one to three m. per hour. The river varies in width from about 1,000 ft. at Pittsburg to 3,000 ft. at its mouth. At high water its breadth is greatly increased. Its depth is extremely variable. At low water it may be forded at many points above Cincinnati. In floods it rises from 30 to 60 ft. above the low water level. At Louisville there are rapids in which the river falls about 27 ft. in 2½ m., but a canal through which large vessels can pass has been constructed. Thus an excellent water-power is supplied and navigation is but slightly impeded. The upper part of the river is generally closed by ice during the winter, and in low water navigation is difficult; but in high water the river and its tributaries offer for large boats a total of 5,000 m. of navigation. At all times steamers can pass as far as Louisville, and during a large part of the summer they are able to reach Wheeling without difficulty. In addition to the two main streams by which it is formed, the Ohio river receives the waters of the Little Kanawha, Great Kanawha, Sandy, Licking, Kentucky, Green, Cumberland, and Tennessee rivers from the s., and the Muskingum, Hocking, Sciota, Great Miami, Little Miami, and Wabash rivers from the n. In the main river there are numerous islands which have been brought under cultivation, and a still larger number of sand-banks appear in its shallow portions. The valley through which it flows presents no grand or imposing features but is noted for quiet beauty, fertile soil, and for the deposits of coal and iron in the ranges of hills through which its upper portion passes. In some places the banks of the tributaries are almost perpendicular, the water having gradually cut its deep and narrow course through the soft limestone of which they are formed, while those of the main river often rise in a series of terraces which spread over quite an area and give a picturesque appearance. The latter formation is seen at Cincinnati, which is built upon two broad terraces, the upper being 52 ft. higher than the other. The constructions of the mound-builders are found in large numbers along the shores of the tributaries entering the lower portion of the river. Among the important towns on the banks of the main stream are Pittsburg, Wheeling, Parkersburg, Ironton, Portsmouth, Newport, Cincinnati, Covington, Louisville, Evansville, Paducah, and Cairo.

OHIO COMPANY, THE: see PUTNAM, RUFUS.

OHIO WESLEYAN UNIVERSITY: educational institution at Delaware, Delaware co., O. Upon the grounds are sulphur springs which once had quite a reputation. A hotel and several cottages were built; but 1841 the property was offered for sale, and after consultation with leading men the citizens of Delaware purchased and presented it to the Meth. Episc. denomination on condition that a satisfactory institution of learning be located on the grounds. The condition was accepted by the church authorities, a preparatory school was commenced 1842, and the institution was formally opened as a university 1844, Nov. 14. The faculty consisted of five persons, only three of whom were able to be present at the beginning of the term, and there were only 29 students. There were many difficulties and discouragements in the early years of the institution but by the earnest efforts of its friends they were gradually overcome. The university now has beautiful grounds, adorned with about 800 varieties of trees and shrubs, numerous buildings, an excellent equipment, and takes high rank of the educational institutions of its denomination. J. W. Bashford, D.D., was inaugurated pres. 1889, Sep. During the college year 1887–8 the institution had 21 professors and instructors; 374 male and 90 female students in the preparatory department; 216 male and 154 female students pursuing the collegiate course, and 2 male and 9 female resident graduates, making a total of 845 students. The number of vols. in the library was 14,136, the buildings and grounds were valued at $201,147, the permanent productive funds amounted to $437,002, and the benefactions for the year were $45,000. Ground has been broken, 1890, Sep., for a new building to cost about $90,000 to be used for a chapel with a seating capacity of 2,500, recitation rooms, and offices. The preparatory course of study covers a period of three years, and the collegiate course four years.

OHLAU, or OLAU, *ō'low*, or OLAWA, *ō-lâ'vâ:* town of Prussian Silesia, 17 m. s.e. from Breslau, on the Oder. O. is on the railway between Breslau and Vienna; it is an ancient town, with a royal palace and an old castle. At present it has considerable industrial activity. Being the cap. of a circle, it has numerous district courts and offices. Pop. (1880) 8,395.

OHM, n. *ōm* [after the celebrated electrician *Ohm*, who first ascertained the laws of electrical resistance]: the unit measure of electrical resistance represented by the Greek *omega*, ω. See ELECTRICAL UNITS: GALVANISM.

OHM, *ōm*, GEORG SIMON: German physicist: 1781, March 16—1854, July 7; b. Erlangen. He was prof. of physics at Nürnberg and at Munich. His fame rests on his study of the galvanic ourrent, with his publication 1825 of his discovery of the law which forms the basis of the mathematical theory of electricity, which theory he pub. 1827 in his only important work, *The Galvanic Chain Mathematically Worked Out*. After him this is named *Ohm's Law* (q.v.).

OHM'S LAW [named from the electrician, *Ohm*, Georg Simon (q.v.)]: law declaring that the intensity of a galvanic current is equal to the electro-motive force divided by the resistance.—The unit of electro-motive force is called a *volt;* the unit of quantity in electrical measurement a *coulomb* or *weber;* the unit of strength of current, an *ampère;* the unit of capacity of electricity, a *farad.* —Also MEGAVOLT, n. *mĕg'ă-vōlt* [Gr. *mega*, great]: one million volts. MEGAFARAD, n. *mĕg'ă-fâr-ăd* [*mega*, and *farad*]: one million farads. MEGOHM, n. *mĕg'ōm* [*mega*, and *ohm*]: one milliom ohms. MICROVOLT, n. *mĭk'rō-vōlt* [Gr. *mikros*, small, and *volt*]: one millionth of a volt. MICROFARAD, n. *mĭk'rō-făr'ăd* [*mikros*, and *farad*]: one millionth of a farad. MICROHM, n. *mī'krōm* [*mikros*, and *ohm*]: one millionth of an ohm.

OIDIUM, n. *ō-ĭd'ĭ-ŭm* [Gr. *oi'dĕin*, to swell up]: important genus of minute fungi of the section *Hyphomycetes*, growing on deceased animal and vegetable substances. They consist of minute tubular threads, forming flocks, white in some species, brightly colored in others, simple or irregularly branched, assuming in their upper part the form of strings of beads, which finally break up into elliptic spores. The species actually existing are probably much more numerous than those ascertained. Among the most important of the vegetable parasites of man is *O. albican*, found on the epithelium in the mouth and throat in the disease called *aphthæ*, or thrush, and on that of the throat in diphtheria, also sometimes in the nostrils, stomach, and intestines, on the nails, the nipples, and other places. It is more frequent in children and aged persons, than in those in the prime of life. It occurs frequently in the last stages of many diseases, when the mucous membrane is covered with nitrogenous decomposable matter. Indeed, it seems that whatever may be the case as to other vegetable parasites, no species of O. begins its attack on a perfectly healthy surface, either animal or vegetable; a diseased state of the tissue being to these fungi a necessary condition of vegetation, 'just as the yeast-plant will not vegetate save in a fermentable fluid, that is, in a solution which, in addition to sugar, contains some decomposable albuminous matter.' *O. albicans* appears to the naked eye as a white pasty substance, slightly elevated above the mucous membrane to which it adheres; but under the microscope, its filamentous structure is easily perceived. Its seat is at first on the upper

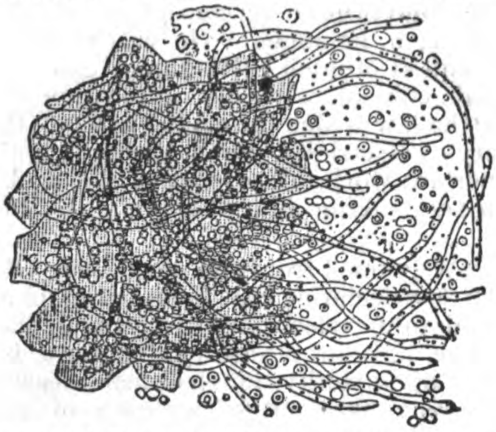

Fig. 1.—Thrush Fungus (*Oïdium albicans*): general view.

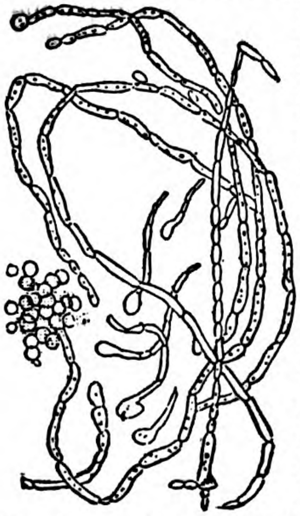

Fig. 2.—Perfectly developed thallus threads, showing constrictions, partition-walls, and ramifications.

surface of the epithelial cells, but its filaments soon penetrate deeply between them, and the upper epithelial layers are soon worn out, and thrown off by the rapid growth from below. However incapable the *O. albicans* may be of attacking a healthy surface, there can be no doubt that it greatly contributes to the extension of disease, and that it is very readily communicated from one patient to another when there is catarrh or other inflammatory affection of the mucous membrane.

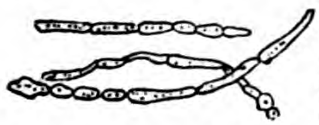
Fig. 3.—Ends of perfectly developed thallus threads, more highly magnified (460 diameters).

Another species of O. which has attracted great attention is *O. Tuckeri*, regarded by many as producing the grape disease, which, several years ago, injured the vineyards of many parts of the world, but in accordance with the views above expressed, perhaps to be regarded rather as merely accompanying and extending the disease. It may probably be the case that over-cultivation of particular varieties of grape, and too long continued cultivation of the same ground, have so impaired the vigor and healthfulness of the plants, as to make them liable to the attacks of this parasite. *O. Tuckeri* makes its appearance at first in the form of a *mycelium* of webby, creeping, branching filaments (fig. 4, *b*), which send out upright or decumbent jointed stems (fig. 4, *a*). The bead-like joints of the stems become successively filled with spores, which are finally discharged in little clouds for the multiplication of the species. The grape disease was first observed in Kent, England, in the spring of 1845, on vines in the vinery of Mr. Tucker. The ends of the young shoots assumed a crispy appearance, began to wither, and then dried up. The unripe grapes were next attacked, becoming covered with a grayish-white bloom, the skin of the grapes being destroyed, and they rotted and dried up. The disease rapidly spread over other English vineries; was observed about the same time in the vineries of Paris, and soon in the vineyards of almost all parts of France, Italy, Greece, Tyrol, and Hungary; finally, and in a slighter degree, affecting the vineyards of the Rhine. Its ravages extended to Algeria, Syria, Asia Minor, and many other

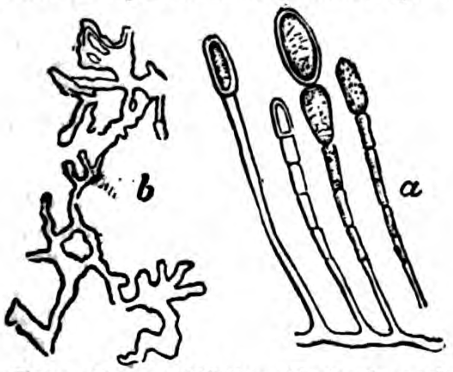

Fig. 4.—Grape Fungus (*Oïdium Tuckeri*): early stage.

countries, particularly the island of Madeira, where it proved almost completely destructive to the grapes, and nearly put an end to the production of the celebrated Madeira wine. The importation of Madeira wine to Britain, 1831, was 209,127 gallons; 1861, only 28,749 gallons. It is probable that the complete isolation of the Madeira vineyards made the progress of the disease more rapid, and its results more complete than elsewhere, by causing a prevalence of the conditions favorable for it. No kind of vine escaped. The grape disease is perceived first in the leaves, which become whitish, in consequence of a mycelium spreading over the upper surface of the leaf. The leaves sometimes curl up, or they become black at the centre, the blackness extending toward the circumference, and finally they drop off. The plant, through loss of its leaves, now becomes more unhealthy; the shoots are attacked by the disease, the stalks of the bunches of grapes, and the grapes themselves. The parasite penetrates into the young wood, the shoots are covered with spots and blotches of a reddish brown, or even black color, and look as if a red-hot iron had been applied to them. Sometimes they secrete a clammy inodorous fluid all over their surface; and in many cases they wither from the top down half their length. The affected grapes very often first exhibit the disease in a single whitish spot on a single grape of a bunch, which enlarges by radiating irregularly. Fig. 5 represents a fragment of a grape with mycelium and erect fertile filaments. If in a bunch there is one abortive grape, it often shows signs of the disease, while the rest remain free. The creeping branches of the mycelium are fixed upon the skin of the grape by rootlets, which do not penetrate into the juicy pulp. The mycelium sends up vertical fertile branches of nearly equal height, densely aggregated, and forming a velvet-like mass. The extremities of these become beaded; and at last the uppermost cell or bead increases in volume, becomes detached, and is carried off by some slight breath of air, to multiply the species by the dispersion of its spores. The other bead-like cells follow in succession.

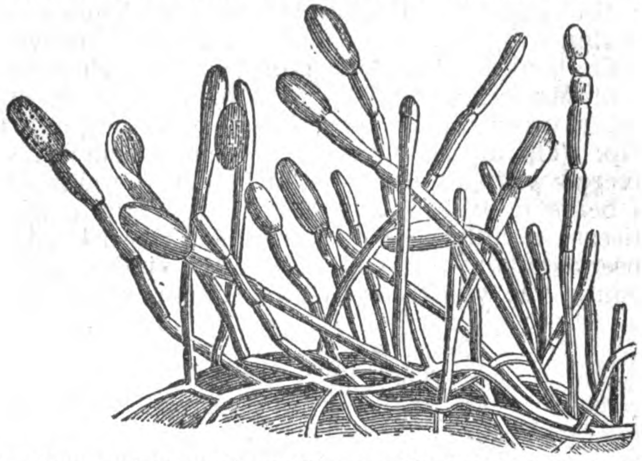

Fig. 5.—Fragment of surface of Grape, with oidium fully developed.

Various means were resorted to for the prevention and cure of the grape disease. The application of pulverized sulphur was found useful, the fungus withering and drying up when brought into contact with a minute particle of sulphur. The application of sulphur must be frequent, as portions of the mycelium and some of the spores always escape. The use of sulphur was the chief means of checking the spread of O. in French and other European vineyards; it became general in s. France and in Italy; and in consequence of its national importance, the duty on sulphur was reduced by the French govt. Hydrosulphide of lime also was applied to vines with very beneficial effect. It is prepared by thoroughly mixing 68 ounces of flowers of sulphur with the same quantity of slaked lime, adding three or four quarts of water, boiling for about ten minutes, allowing it to settle, and decanting the clear liquor. When used, one quart is mixed with 100 quarts of water, and it is poured over the vines.

OIL, n. *oyl* [OF. *uile* and *oile*—Sp. *olio*—from L. *ŏlĕŭm*, oil: Ger. *oel;* Dan. *olie*, oil]: highly inflammable fatty liquid expressed or obtained from various animals, from many vegetable substances, and as a natural product from the earth (see OILS): V. to smear or rub over with oil. OIL'ING, imp. OILED, pp. *oyld.* OILY, a. *oyl'ĭ*, containing or resembling oil; greasy. OILINESS, n. *oyl'ĭ-nĕs*, the quality of being oily; greasiness. DRYING OILS, oils which dry and lose their greasy feeling, as *linseed* oil, as distinguished from UNCTUOUS OILS, which do not so dry, as *olive* oil. VOLATILE or ESSENTIAL OILS, oils that pass away in the form of vapor at the temperature of boiling water. MINERAL OIL, an oil extracted from a shale or mineral, as *paraffin.* ROCK-OIL, a natural oil which rises from the earth, as from a spring or well. OIL-CAKE, flat cakes of flax-seed, rape-seed, etc., from which the oil has been expressed (see below). OIL-COLORS, painters' colors or pigments formed of finely ground mineral substances worked up with oil. OILED PAPER, transparent paper used for tracing purposes. OILED SILK, prepared silk impervious to moisture, employed in making balloons, etc. OILING OUT, among *artists*, a thin coating of drying oil passed over the parts of a picture to be retouched, which is immediately wiped off, leaving thus only a slight coating on the surface. OIL-CLOTH, painted floor-cloth (see FLOOR-CLOTH). OIL-GAS, a gas obtained from oil. OILMAN, one who sells oils. OIL-MILL, a mill for crushing seeds in order to obtain their oil. OIL-NUT, the butternut of N. Amer.; a shrub; the Palma Christi. OIL-PAINTING, a picture painted with colors which have been mixed with oil; the art of painting in oil-colors. OILSKIN, a sort of waterproof cloth. OIL STONE, a sort of hone-stone of a white or black color, imported from Turkey. OIL-TREE, the Palma Christi, or castor-oil plant. OIL OF VITRIOL, the popular name for sulphuric acid. OILY GRAINS, the seeds of the sesamum, an eastern grain-plant which contains abundance of oil. OIL-COALS, the coals or shales which yield large quantities of oil on distillation. OIL-SPRINGS, or OIL-WELLS, springs in which oil rises out of the earth as a natural production, like springs of water.

OIL-CAKE: cake which remains in the press, when seeds are crushed to express the oil which they contain. Oil-cake still retains a portion of the oil of the seed with almost all its other constituents, and is valuable either for feeding cattle or for manure. In some countries *Linseed-cake* is so much more largely used than any other kind, that the name oil-cake is in general appropriated to it, the other kinds being known as *Rape-cake, Poppy-cake, Hemp-cake, Colza-cake,* etc., according to the plant from whose seed they are produced. The use of oil-cake for feeding cattle has very much increased of late years, and it is an article of commercial importance. Large quantities are exported from different parts of Europe and from N. America. But *English Linseed-cake*—cake made at oil-mills in England, mostly from imported seed—is preferred to any other, because heat not being so freely applied during the expression of the oil, more oil is left in the cake, and also because foreign cake often receives injury from dampness both before and during the sea passage. Besides the oil which remains in it, linseed-cake contains 24 to 33 per cent. of nitrogenous substances or protein compounds, which make it very valuable both for feeding cattle and for manure. The value of linseed-cake for feeding is greater than that of any kind of grain or pulse.—*Rape-cake* is much cheaper than linseed-cake, but is not relished by cattle, having a hot taste, and a tendency to become rancid. Sheep, however, eat it readily, and it is often used for fattening them. It is also ground to a coarse powder (*rape-dust*), and used as manure. Its fertilizing power is great, and it is used by the Flemish farmers as guano has been used by those of the United States.—*Cotton Seed-cake* is much used as a manure in parts of N. America.—*Cocoa-nut-cake* is used in s. India, both for feeding cattle and for manure.—For some other kinds of oil-cake, see the plants from which they are derived. Their properties are generally similar to those of linseed-cake, though the pungency of some, as *Mustard-cake,* renders them unsuitable for feeding cattle. See OILS.

OIL CITY: city, Venango co., Penn., at the junction of Oil creek with the Allegheny river, on the Allegheny Valley, the Western New York and Pennsylvania, the Erie, and the Lake Shore and Michigan Southern railroads; eight m. from Franklin, the cap. of the co., 132 m. from Pittsburg. The business portion of the city is close to the river, and nearly all the residences are built on the higher land. The buildings are largely of brick, the streets are paved and lighted with gas, and there is a good system of water-works. There are 12 churches, two daily and two weekly newspapers, one national, one state, and three private banks, an oil exchange, a branch of the Young Men's Christian Assoc., an opera-house, and four large and several smaller hotels. The city is the great centre of the petroleum production of the country. Manufactures are not extensive; but there are wagon shops, foundries, barrel shops, and oil-refining works. The river flows through the city, and is crossed by fine bridges. From Clark's Summit, to which access is gained by an inclined railroad, a beautiful view is obtained. The first oil-well in the place was sunk 1859. There were then only 12 families residing within the present limits of the city, but its growth for a few years was quite rapid. The place was incorporated as a borough 1862, and received a city charter 1871. Pop. (1880) 7,315; (1890) about 10,000.

OIL FUEL: see PETROLEUM.

OILLET, or OILLETTE, or OYLET, n. *oy'lĕt* [F. *œillet*, dim. of *œil*, an eye]: in *arch.*, openings or loopholes made in the battlements and walls of mediæval fortifications, through which arrows were discharged at the besiegers.

OIL ON THE WAVES.

OIL ON THE WAVES: means of safety for vessels in storms, the efficacy of which, though known to the ancients, has only of late received practical recognition among modern seamen. The action of the oil consists in preventing the combs of the waves from breaking and sweeping over the vessel's deck. Detailed directions for the employment of oil in various circumstances of danger at sea are now given in works on practical seamanship, and vessels go to sea provided with the necessary oil and appliances for diffusing it on the water. If a bar is to be crossed in heavy weather, after battening down all hatches, etc., 2 pieces of India-rubber pipe, abt. 20 ft. long and 1-in. diameter, are to be put through the hawse-pipes, one on each side, and their ends allowed to trail in the sea. On the upper end of each piece of tube, a good-sized funnel is to be lashed, and secured to the stanchion in a vertical position, and a man stationed at each with a 3-gal. can of colza-oil. When the vessel enters the outermost sea that breaks on the bar, each man gently pours the oil down the pipe. This will smooth the bar, and the vessel will steer much better. Almost any oil of animal or vegetable origin will do; but petroleum is not of much service, except to mix with and thin other oil, if requisite. When lying to in a gale, head to wind and drifting slowly, if a little oil is used, a ship ought to pull through the heaviest storm. Running in a gale, an oil-bag hung over the weather-side, or oil poured down a pipe well forward, is of great service in preventing the sea from breaking aboard; if the gale, increasing, makes it desirable to round to, the method is, to prepare a sea-anchor, watch for a smooth spell, and then put the helm down, heave overboard a few gallons of oil, and float the sea-anchor. Keep pouring the oil on the sea, down a weather-pipe or scupper, while the ship is coming up to the wind. A well-equipped sailing-ship, even if deeply laden, will lie to under a closely reefed topsail or tarpaulin in the rigging, and weather almost any gale, so long as she is not taken aback. Sailing-vessels under these circumstances now often use an oil-bag paid out to windward, to smooth the sea still more: this is the ideal position of a laden vessel at sea in a dangerous storm. While towing a disabled ship over a bar, or where the sea is very wild, a couple of oil-bags over the stern will ease the sea on the tow. With a good steamer, to take a shipwrecked crew off a wreck, the best way is to run to windward of the wreck, lower the lee boat, put the steamer head to sea and dead to windward, and let the boat drop down toward the wreck: by constantly pouring out oil, the sea will be, in great degree, stilled between the steamer and the wreck.

OIL PALM (*Elæis*): genus of palms, of the same tribe with the cocoa-nut palm. The best known species, the O. P. of tropical Africa, sometimes attains a height of 60-80 ft. The stems are thickest in the middle, tapering chiefly upward. The leaves are pinnate, their footstalks spiny. The flowers have a strong peculiar smell, like that of anise or chervil. The fruit forms an immense head, like a great pineapple, consisting of a great number of bright orange-colored drupes, having a thin skin, an oily pulp, and a hard stone. The pulp of the drupes, forming about three-fourths of their whole bulk, yields, by bruising and boiling, an oil, which when fresh has a pleasant odor of violets, and when removed into colder regions acquires the consistency of butter. This oil is now very largely exported from tropical Africa to western lands, and is much used for many purposes, e.g., for making candles, toilet soaps, etc., and for lubricating machinery and wheels of railway carriages. When fresh, it is eaten like butter: see OILS. The nut was formerly rejected as useless after the oil had been obtained from the fruit; but from its kernel a fixed oil is now extracted called PALM-NUT OIL; which is clear and limpid, and has become to some extent an article of commerce. The O. P. abounds in mangrove swamps, but is a conspicuous feature of the landscape also on sandy coasts in tropical parts of w. Africa. It yields from its trunk abundance of a pleasant and harmless beverage, which, however, becomes intoxicating in a few hours; called *Malova* in Angola, and much used there as an alcoholic stimulant. The unripe nuts of the O. P. are used in parts of Africa for making an excellent kind of soup. The O. P. has been introduced into warmer parts of America, and has become abundant in them.

Oil Palm.
(Copied from Livingstone's *Travels in Central Africa.*)

OIL-REFINING: purifying of oils. Several oils, from the mode of their extraction, are necessarily impure, and various means are taken for refining or purifying them: thus, the so-called *fish-oils*—that is, whale, seal, cod, etc.—are clarified either by mixing them with a chemical solution, or by passing steam through them and filtering through coarse charcoal. The chemical solutions employed are various. One method is, to use a strong solution of oak bark, the tannic acid in which combines with the albuminous matters present in the oil, and precipitates them; another plan is, to agitate bleaching-powder, formed into a milk with water, with the oil; and then, after subsidence of the chloride of lime and water, to wash the oil with water, or jets of steam passed through it. A more simple and very effective plan is to apply a steam heat not exceeding 200° F., and then pass a current of air of the same temperature through it continuously for some time: this effectually bleaches the oil.

Olive, and some other vegetable oils, are refined by agitating them with a saturated solution of caustic soda. This renders the whole soapy; but after a time the oil precipitates a saponaceous deposit, and the remainder becomes quite clear and pure, and is then poured off. The value of several of the most important oils of commerce is so greatly increased by refining that this art has now become a very important and extensive business.

OILS (including the Fats): an important and well-marked group of organic compounds abundant both in the animal and in the vegetable kingdoms. They are not simple organic compounds, but each of them is a mixture of several such compounds to which the term *glycerides* is applied; and the glycerides which by their mixture in various proportions form the numerous fats and oils are mainly those of palmitic, stearic, and oleic acids—if we adopt the recent view that Margaric Acid (q.v.) has no independent existence—and to a less extent those of other fatty acids, noticed below, such as butyric, caproic, caprylic, and capric acids, obtained from butter; myristic acid, obtained from cocoa-nut oil, etc. The members of this group may be solid and hard, like suet; semi-solid and soft, like butter and lard; or fluid like the oils. The solid and semi-solid are, however, generally placed together and termed fats, in distinction from the fluid oils. The most solid fats are readily fusible, and become reduced to a fluid or oily state at a temperature lower than that of the boiling point of water. They are not volatile, in other words they cannot be distilled without decomposition, and it is not until a temperature between 500° and 600° is reached that they begin nearly simultaneously to boil and to undergo decomposition, giving off acrolene (an acrid product of the distillation of glycerine) and other compounds. In consequence of this property these oils are termed *fixed oils*, in contradistinction to a perfectly separate group of oily matters, on which the odoriferous properties of plants depend, and which, from their being able to bear distillation without change, are known as *volatile oils*. These, known also as *essential* or *ethereal oils*, differ *in toto* in chemical composition from the compounds which we are now considering, and will be separately noticed in the latter part of this article. All the fats and oils are lighter than water, and are perfectly insoluble in that fluid. Their specific gravity ranges from about 0·91 to 0·94. They dissolve in ether, oil of turpentine (one of the volatile oils), benzol, and to a certain extent in alcohol; while on the other hand they act as solvents for sulphur, phosphorus, etc. If a fatty matter be shaken with a watery solution of albumen, gum, or some other substance that increases the density of the water and renders it viscid, the mixture assumes a milky appearance, in consequence of the suspension of the fat or oil in the form of microscopic globules, and is termed an *emulsion*. These bodies possess the property of penetrating paper and other fabrics, rendering them transparent and producing what is well known as a greasy stain. They are not readily inflammable unless with the agency of a wick, when they burn with a bright flame. In a pure and fresh state they are devoid of taste and smell, but on exposure to the air they become oxidized and acid, assume a deeper color, evolve a disagreeable odor, and are acrid to the taste; or, in popular language, they become *rancid*. The rapidity with which this change occurs is considerably increased by the presence of mucilaginous or albuminous bodies.

The rancidity may be removed by shaking the oil in hot water in which a little hydrated magnesia is suspended.

For the general diffusion of fats and oils in the animal kingdom, see FATS, ANIMAL. In the vegetable kingdom they are equally widely distributed, there being scarcely any tissue of any plant in which traces of them may not be detected; but they are abundant specially in the seeds. The seeds of the *cruciferæ* are remarkably rich in oil; linseed yielding fully 20 per cent., and rape-seed about 40 per cent. of oil; and some fruits, as those of the olive and oil-palm, yield an abundance of oil.

The uses of the oils and fats are numerous and highly important, various members of this group being extensively employed as food, as medicines, as lubricating agents, in the preparation of soaps, plasters, ointments, varnishes, pigments, candles and other means of illumination, for the purpose of dressing leather, etc. The following are the most important members of the group.

1. *Vegetable Fats.*—The chief solid fats of vegetable origin are cocoa-nut oil, nutmeg butter, and palm oil. The fluid vegetable fats or oils are divisible into *non-drying* and *drying oils;* the latter being distinguished from the former by their becoming dry and solid when exposed in thin layers to the air in consequence of oxygenation, while the former do not absorb oxygen, but are converted by hyponitric acid or suboxide of mercury into elaidine (see OLEINE), a reaction not exhibited by the drying oils. Some of the drying oils, especially linseed oil, when mixed with cotton, wool, or tow, absorb oxygen so rapidly and consequently become so heated as to take fire, and many cases of the spontaneous combustion of heaps of oily materials that have been employed in cleaning machinery have been recorded. The drying property may be much increased by treating the oils hot with a little litharge or with borate or oxide of manganese; linseed oil thus treated is known as *boiled oil.* The chief non-drying oils are olive oil, almond oil, and colza oil; while the most important drying oils are those of linseed, hemp, poppy, and walnut; castor oil seems to form a link between these two classes of oils, since it gradually becomes hard by long exposure to the air.

2. *Animal Fats.*—The chief solid fats are suet, lard, butter, goose grease, etc., while among the fluid fats or oils, sperm oil, ordinary whale oil, cod-liver oil, and neats-foot oil may be especially mentioned. In many of their characters, spermaceti and bees-wax resemble the solid fats, but (see those titles) they are not glycerides. As a general rule, stearin and palmitin, both of which have comparatively high fusing points (between 157° and 114°), preponderate in the solid fats; while oleine, fluid at 32°, is the characteristic constituent of the oils.

One or two of the most important of the decompositions of the fats must be noticed. When any of these bodies are heated with hydrated alkalies they undergo a change which has long been known as Saponification, or conversion into Soap (q.v.), in which the fatty acid combines with the alkali to form a *soap*, while the sweet viscid liquid glycerine is simultaneously formed. The combination of a fatty acid with oxide of lead, also a true saponification, produces free glycerine and a *lead soap* used in pharmacy, and termed *lead plaster*. For further details on these points see SOAP: PLASTERS.

The process of saponification affords a ready means of isolating the fatty acids, as the stearic or oleic acid may be at once separated from an alkaline stearate or oleate by the addition of hydrochloric or tartaric acid. When the fatty acids are, however, required on a large scale, as for manufacture of the so-called stearine candles, which in reality consist mainly of stearic and palmitic acids, sulphuric acid and the oil or fat are made to act on each other at high temperature: see CANDLE. The fatty acids may be procured in a very pure form also by the injection of superheated steam at a temperature between 500° and 600° into heated fat—a process which, according to Prof. Miller, 'from its simplicity and from the purity of the products which it yields, bids fair to supersede those previously employed in the preparation of the fatty acids for illuminating purposes.'

The only fatty acids which have been specially mentioned in this article are those which occur in natural glycerides, such as stearic, palmitic, and oleic acids. The term *fatty acid* has, however, in Chemistry a wide signification, and is applied to many acids homologous to stearic acid, but not occurring in any natural fats or oils. Thus stearic acid may be taken as the type of a group of acids (of which 17 are already known) represented by the general formula $C_nH_{2n}O_2$, commencing with formic acid (CH_2O_2), including acetic, propionic, butyric, valeric (or valerianic), caproic, œnanthylic, caprylic, pelargonic, capric, lauric, myristic, palmitic, stearic, arachidic, and cerotic acids, and terminating with melissic acid ($C_{30}H_{60}O_2$). These are divided into the volatile and the true (or solid) fatty acids; the volatile acids being those from formic to capric acid, while the remainder, beginning with lauric acid, are the true fatty acids. The *volatile fatty acids* are fluid and for the most part oily at ordinary temperatures, may be distilled without change, possess a pungent odor, and are acrid to the taste, and their solutions redden litmus paper strongly. The *true fatty acids*, on the other hand, are solid at ordinary temperatures, are devoid of taste and smell, cannot be distilled, except *in vacuo*, without decomposition, and exert only a slight action on litmus. The volatile acids occur in the animal and vegetable kingdoms (formic acid, e.g., in red ants, and valeric acid, in the root of valerian), and they are produced likewise by the oxidation and spontaneous decomposition of numerous animal and vegetable products. The entire series up to capric acid may be obtained by oxidizing oleic acid with nitric acid. The true or solid acids occur only as constituents of animal and vegetable fats.

Some chemists make a second group of fatty acids, of which oleic acid is the type, and which have the general formula $C_{2n}H_{2n-2}O_4$; but Oleic Acid (q.v.) is the only member of this group of any practical importance.

A complete list of even the chief fats and fixed oils would take up far more space than we can command. For many of the principal oils, and some account of their properties and uses, see the separate titles, e.g., ALMOND OIL, CASTOR OIL, CROTON OIL; or see the titles of the substances from which they are procured, e.g., LINSEED, RAPE, CANDLE-NUT.

The *Volatile* or *Essential Oils* exist, in most instances, ready formed in plants, and are believed to constitute their odorous principles. They form an extremely numerous class, of which most of the members are fluid; a few (oil of aniseed for example) being solid at ordinary temperatures, but all are capable of being distilled without undergoing change. They resemble the fixed oils in their inflammability, in their solubility in the same fluids, and in their communicating a greasy stain to paper or any other fabric; but the stain in this case soon disappears, and they further differ in communicating a rough and harsh rather than an unctuous feeling to the skin. Their boiling points are in almost all cases far higher than that of water, but when heated with water they pass off with the steam—a property on which one of the chief modes of obtaining them depends: see PERFUMERY. The oils have characteristic penetrating odors, which are seldom so pleasant as those of the plants from which they are obtained, and their taste is hot and irritating. They vary in specific gravity, but most of them are lighter than water, and refract light strongly. Most of them are nearly colorless when fresh, but darken on exposure to light and air; but a few are green, and two or three of blue color. By prolonged exposure they absorb oxygen and become converted into resins.

By far the greater number of them are products of the vital activity of plants, in which most of them exist ready formed, being inclosed in minute cavities often visible to the naked eye. Although diffused through almost every part of a plant, the oil is especially abundant in particular organs of certain families of plants. In the *Umbelliferæ*, it is most abundant in the seeds; in the *Rosaceæ*, in the petals of the flowers; in the *Myrtaceæ* and *Labiatæ*, in the leaves; in the *Aurantiaceæ*, in the rind of the fruit. As in the case of the animal and vegetable fats and fixed oils, so most of the essential oils occurring in plants are mixtures of two or more distinct chemical compounds, one of which usually contains no oxygen, while the others are oxidized. Of these, the former, which is a pure hydrocarbon, is the more volatile, and acts as a solvent for the others. Most of these oils, when cooled, separate into a solid and a fluid portion, to which the terms *Stearopten* and *Elæopten* have been applied.

In the comparatively few cases in which the oils are not formed naturally they are produced by a species of fermentation, as in the case of Oil of Bitter Almonds and Oil of Mustard (q.v.), while others are the product of dry distillation or of the putrefaction of many vegetable bodies.

Some of the natural oils, as those of cinnamon, spiræa, and wintergreen, also have been artificially produced.

The essential oils are much employed in the fabrication of Perfumery (q.v.), for flavoring liquors, confectionery, etc., for various purposes in the arts (as in silvering mirrors), and in medicine. The special uses of the most important of these oils in medicine will be noticed subsequently.

The members of this group, which is an extremely numerous one (between 100 and 200 essential oils being noticed in works devoted to the specific treatment of this subject), admit of arrangement under four heads. 1. Pure Hydrocarbons; 2. Oxygenous Essential Oils; 3. Sulphurous Essential Oils; 4. Essential Oils obtained by Fermentation, Dry Distillation, etc.

1. The *Pure Hydrocarbons* are mostly fluid, and have lower specific gravity, a lower boiling point, and higher refractive power than the oxygenous oils. They absorb oxygen, and are converted into oxygenous oils and resins. They may be separated from oxygenous oils, with which they are usually associated, by fractional distillation. They include oil of turpentine ($C_{10}H_{16}$), and the oils of bergamot, birch, camomile, caraway, cloves, elemi, hop, juniper, lemons, orange, parsley, savine, and valerian, most or all of which contain the same hydrocarbon as Oil of Turpentine (q.v.), and in addition to it an oxidized compound; oil of copaiva ($C_{15}H_{24}$), attar of roses (C_8H_{16}), etc.

2. The *Oxygenous Essential Oils* may be either fluid or solid, the latter being termed also *Camphors*. A stearopten separates from most of the fluid oils on cooling. They are more soluble in water and spirit of wine than the pure hydrocarbons. They may be divided into (1.) those which are fluid at ordinary temperatures, such as those of aniseed, camomile,* cajeput. caraway,* cinnamon, cloves,* fennel, lavender, peppermint, rue, spiræa, thyme,* wintergreen, etc. Those marked with a (*) are associated with the pure hydrocarbons above described. (2.) The camphors, such as ordinary camphor ($C_{10}H_{16}O$), Borneo camphor ($C_{10}H_{18}O$), etc.

3. The *Sulphurous Essential Oils* are chiefly obtained from the *Cruciferæ*. They all probably contain the radical *allyl* (C_3H_5). The oils of garlic and of mustard (see these titles), and those of horse-radish, scurvy-grass, and asafetida, are the best illustrative of this division.

4. Among the essential oils obtained by fermentation, dry distillation, etc., are the oils of bitter almonds and of black mustard, the oils of milfoil, plantain, centaury, etc. (whose leaves have no smell until they have been moistened for some time with water, when a kind of fermentation is set up and oil is yielded in abundance), Furfuramide (q.v.), etc.

The pharmacopœia contains the essential oils of anise, cajeput, caraway, camomile, cinnamon, cloves, copaiva, coriander, cubebs, dill, juniper, lavender, lemon, nutmeg, peppermint, pimento, rosemary, rue, savine, spearmint, and turpentine. Of these, the oils of anise, cajeput, caraway, camomile, coriander, dill, peppermint, pimento, and spearmint are used as stimulants and antispasmodics in cases of flatulence, griping, etc., and to disguise the nauseous taste of various medicines. The oils of cajeput, cinnamon, and rue act similarly but more powerfully. The oils of copaiva and cubebs act in the same manner as the substances from which they are derived; oil of juniper is a powerful diuretic, and oil of savine (and to a less extent oil of rue) an emmenagogue. The oils of lavender and lemon are used to conceal the smell of sulphur ointment and to give an agreeable odor to lotions, etc. The oil of rosemary is employed chiefly as a stimulating liniment, especially in cases of baldness, and the oil of nutmeg is seldom given medicinally except in the form of aromatic spirit of ammonia, into the composition of which it enters.

Essential oils for flavoring are not always derived from the substances of which they are intended to communicate the flavor. Thus an essential oil indistinguishable (or nearly so) from that of pine-apples may, by recent methods, be obtained from butyric acid, a product of rancid butter or putrid cheese; and a very serviceable 'essence of pears' is procured from the offensive fusil oil.

Bland oils—such, for example, as olive oil—were much used by the ancients as external applications in various forms of disease. Celsus repeatedly speaks of the use of oil applied externally with friction in fevers, and in various other diseases. Pliny says that olive oil warms the body and at the same time cools the head, and that it was used with these objects previously to taking cold baths. Aretæus recommends a sitz-bath of oil in cases of renal calculi, and Josephus relates that a similar mode of treatment was employed in the case of Herod. Galen prescribed 'oil and wine' for wounds in the head; and the parable of the good Samaritan affords additional evidence that this was a common mode of treating wounds. The use of oil preparatory to athletic exercises is referred to by numerous Greek and Latin writers.

As a cosmetic—that is to say, as a means of giving to the skin and hair a smooth and graceful appearance—its use has been prevalent in hot climates from the earliest times. There is abundant historical evidence of this use of oil among the Egyptians, the Jews, the Greeks, and the Romans; and Pliny's statement that butter is used by the negroes and the lower class of Arabs for the purpose of anointing is confirmed by the observation of all recent African travellers. In hot climates there is doubtless a practical as well as an æsthetic object in anointing. The oil, being a bad conductor of heat, affords a certain amount of protection against the direct action of the solar heat; it is likewise serviceable as a protection against the attacks of insects and as checking excessive perspiration. The fact that oily and fatty matters are bad conductors of heat serves also to explain why the Esquimaux and other dwellers in Arctic regions have recourse to the inunction of the blubber, etc. In their case the oily investment serves to prevent the escape of the bodily heat.

The Greeks and Romans not only employed oil for the purposes above mentioned, but in their funereal rites, the bodies of their dead being anointed with oil, with the view probably of postponing incipient decomposition. A similar practice existed among the Jews, and in the Gospels are various passages in which the Lord Jesus referred to his own body being anointed by anticipation. It appears from the evidence of St. Chrysostom and other writers that this ancient usage of anointing the bodies of the dead was long retained in the Christian Church: see UNCTION: EXTREME UNCTION.

It is noticeable that the ancient system of anointing, as a medical treatment, has to some extent been revived in modern times. Many physicians of the present day combine the inunction of cod-liver oil with its internal administration, a combination recommended first by Prof. Simpson of Edinburgh; and Sir Henry Holland advocates the practice of anointing the harsh, dry skin of dyspeptic patients with warm oils. There can be little doubt that in many forms of disease the local application of medicinal oils is advantageous.

For the *mineral oils*, see NAPHTHA: PARAFFIN: PARAFFIN OIL: PETROLEUM: SHALE.

OILS IN THEIR COMMERCIAL RELATIONS.—The solid animal oils found in commerce are butter and lard, tallow, mares' grease, goose grease, neats-foot oil, and unrefined yolk of egg oils. For two first, see BUTTER: LARD. Tallow is the fat of oxen and sheep, especially the fat which envelops the kidneys and other parts of the viscera, rendered down or melted. The qualities of this solid oil render it particularly well adapted for making candles, and until the end of the first quarter of the 19th c. candles for ordinary use were almost wholly made of it, the high price of wax and spermaceti preventing their employment except by the most wealthy and for ecclesiastical purposes. Besides its use in making candles tallow is most extensively used in the manufacture of soap, and for the purpose of preserving machinery from rust. The trade in tallow with Russia and with N. and S. America, and even with India and other countries, is considerable; but it is declining because of the extension of gas and the enormous development of the Paraffin and Petroleum (q.v.) oils, and other light-giving materials. One of the chief uses of tallow is now in the manufacture of Soap (q.v.); and even in this it has yielded in importance to palm and cocoa-nut oils.

Mares' grease is not nearly so solid as tallow; it is a yellowish-brown grease, imported extensively from Montevideo and Buenos Ayres, where vast numbers of horses are slaughtered for their hides, bones, and grease; it is particularly valuable as a lubricant for machinery, and is employed chiefly for that purpose after much of its stearin has been removed for candle-making. It is said that the name *mares'* grease arises from the fact that in S. America horses are chiefly used alive, while mares are slaughtered as comparatively useless. Goose grease is another soft fat, much valued by housewives for many purposes, but excepting that it is sold in some districts as a remedial agent, it has no commercial importance. Neatsfoot oil is a soft fat procured in the preparation of the feet and intestines of oxen for food as sold in the meat-shops. The quantity obtained is not very great, but it is in much request by curriers for dressing leather. Yolk of egg oil is a hard oil, which, though little known in some countries, is extensively used where eggs are cheap; e.g., in Russia it is manufactured on so large a scale as to supply some of the largest makers of fancy soaps, and it forms the principal material in the celebrated Kazan soap; and certain pomades are made of it which have great reputation and realize very high prices. This oil is not unlike palm oil in color and consistency, but when refined is liquid and has a reddish-yellow color. Its price at Moscow is as high as $2 per lb.

The liquid animal oils are more numerous, and, excepting tallow, are far more important, the so-called fish-oils being the principal. These are whale, porpoise, seal, cod, herring, shark, menhaden, etc. The whales which are pursued for their oil are: (1.) The sperm whale. This huge creature is from 60 to 70 ft. in length, and yields generally from 5,000 to 6,000 gallons of oil. The finest oil is taken from the great reservoir on the head. The oil of this species is all of a quality superior to others, and is known as sperm oil. For the method of procuring this oil, see CACHALOT. (2.) The right whale, which yields by far the largest proportion of whale oil. This, with that yielded by other less important species, is usually called train oil. The term *train* is supposed to be a corruption of *drain*, and applies to the circumstance of the oil being drained out of the blubber; and in this sense it is also applied to sperm oil from the blubber of the cachalot, in distinction from the finer oil from the head matter. The right whale forms the chief object of the northern fisheries, but other species of *Balænæ* are pursued in different parts of the world for their oil: see WHALE.

Among the smaller Cetaceans, the porpoises—called also dolphins ('puffydunters' on the e. coast of Scotland)—and grampuses yield an excellent oil, second only in value to that of regular oil whales.

A large quantity of very valuable oil is obtained from seals, and the seal-fishery as a means of obtaining oil is only second in importance to that of the whale. It is carried on chiefly on the shores of Newfoundland, Greenland, and Labrador. Like the whales, the seals have a thick layer of blubber, in which the oil is contained: see SEAL. The first draining from the blubber is of fine clear pale-straw color; the next, yellow or tinged; and the last is brown or dark. The whale and the seal oils are nearly all used for burning in lamps, and for this purpose they are admirably adapted by their great illuminating power. They are also the best lubricants for machinery.

Of the true fish-oils, that from the cod is of much importance, especially since its medicinal properties were discovered. It is made only from the liver of the fish; and the attempt to induce a popular belief that the so-called cod-liver oil was different from the ordinary cod oil of commerce was simply a cheat; no difference exists, and the oil is obtained just as good from the oil merchant at a moderate price per gallon as from the empiric at an exorbitant price per pint. Indeed, the purer the oil can be got the better it is in a remedial point of view, notwithstanding the efforts made to convince the public that a certain color is better than any other.

Instead of the old and somewhat rude methods of preparing the oil (see COD-LIVER OIL), much more complete and efficient arrangements are now adopted. The livers, when taken from the fish, are all examined, washed in clean water, and placed in sieves to dry. Thence they are transferred to pans heated with steam, and after being exposed to a gentle heat about three-quarters of an hour the heat is discontinued; and when cold, the oil which has separated is skimmed off and strained through flannel bags into tubs. Here certain impurities subside, and the clear oil is poured off from the dregs, and the contents of numerous tubs are transferred to galvanized-iron cisterns, in which a further settlement takes place. The oil is now ready for the filters, which are made of the strong cloth called moleskin, through which it is forced by atmospheric pressure into the store-tanks, which also are of galvanized iron. Hence it is pumped into the casks for export, which are usually hogsheads, tierces, and barrels. Besides its consumption in lamps, and for medicinal purposes, cod oil is used in making some kinds of soap. Oil is occasionally made from the herring, but not in very great quantities; it, however, forms a commercial article. It is made from the whole of the fish, the smell of which it retains to a very disagreeable extent.

The lightest of all the fixed oils is made from the liver of the common shark; it ranges from specific gravity 0·865 to 0·867. This, and the oil made from the livers of the common skate (*Raia batis*), the thornback (*R. clavata*), and the white skate (*Rhinobatus cerniculus*), are often substituted for the cod-liver oil used medicinally, but have not its valuable properties.

The oil expressed after steaming from the menhaden or bony fish of the Atlantic coast of the United States has acquired much importance in commerce. It is said to be used as an adulterant of linseed oil. Rope-makers and others use it.

Under the name of lard oil large quantities of the oleine of lard have been made of late years in America, and exported. It is a secondary product, arising from the great manufacture of lard stearin for candle-making which has arisen in this country, and is used principally as a lubricant for machinery.

The solid vegetable fixed oils which find a place in commerce are palm oil, cocoa-nut oil, kokum or vegetable tallow, and carapa or carap oil. The palm oil is of bright orange-yellow color and an agreeable violet odor; it is obtained from the not very thick covering of the hard seeds of the Oil-palm (q.v.). The fruits, when gathered, are shaken out of the clusters, and are laid in heaps in the sun for a short time, after which the natives boil them slowly in water, when the oil separates and is skimmed off the surface, and carried in small quantities to the depots of the traders, who transfer it to casks prepared to receive it on board the ships. The quantity thus collected is enormous. The imports into Britain alone for the five years 1876-80 were as follows, in cwts.: (1876) 879,824; (1877) 897,264; (1878) 670,797; (1879) 881,329; (1880) 1,032,823. Previous to 1840 the chief use of palm oil was in making soap, but it was about that time found that the palmitin or fat acid of this oil was admirably adapted for manufacture of Candles (q.v.); and since then it has become of much greater importance.

Cocoa-nut oil is a white fat, with the peculiar smell of the kernel; it is made by grinding or pounding the kernel of the cocoa-nut, termed in its dry state *kola*. After it has been boiled in water for a short time, the paste is submitted to great pressure, and a large quantity of milky juice is obtained; this is slowly boiled, and the oil separates and rises to the surface in considerable quantity, and is skimmed off. Twenty ordinary-sized nuts will yield as much as two quarts of oil. This oil is now very largely imported into western countries, and, treated in the same way as palm oil, forms a stearin, which greatly improves that of palm oil when mixed with it in proper proportions; neither does so well separately, and the consumption of cocoa-nut oil has consequently greatly increased. Most of it comes from Ceylon, where the tree is largely cultivated on purpose. The imports to Great Britain (1880) were 318,454 cwts. By far the greater proportion of this vast quantity is used by the candle manufacturers, and the remainder in making common soap, its disagreeable smell preventing it being employed for the better kinds.

Vegetable tallow, or kokum oil, also is used in small quantities by the candle-makers. It comes from Singapore, and is produced from the seed of *Garcinia purpurea*, a species of the same genus with the mangosteen. Another kind of vegetable tallow is made in China, from the seeds of *Stillingia sebifera*.

Carapa, carap, crab, or andiroba oil, is very extensively made in British Guiana and the W. Indies, but it is nearly all used there, either as a pomade for preserving the hair, or as an unguent for rheumatism and neuralgic pains, for which purposes it is said to be very useful: see CARAPA.

The bassia oil is beginning to attract attention in England, and several importations have taken place from India, and some rather large quantities have reached Liverpool from Bombay, under the name Muohwa oil. This oil is of soft, butter-like consistence and yellowish-green color, and is well adapted for soap-making and for machinery grease: see BASSIA.

The liquid vegetable oils are very numerous, and several are of great commercial importance. First in rank is olive oil, made from the ripe fruit of the common olive (*Olea*

Europea). When good and fresh it is of pale greenish-yellow color, with scarcely any smell or taste, except a sweetish nutty flavor, much esteemed by those who use it. The finest qualities are the Provence oil (rare in this country) Florence oil, and Lucca oil. These are used for salads and for cooking. The Genoa is used on the continent for the same purposes; and Gallipoli, which is inferior, constitutes the great bulk of what is exported for cloth dressing, Turkey-red dyeing, and other purposes; the continental soap-makers also employ it extensively. The high price of the best qualities leads to much adulteration with poppy and other oils, but it is generally safe when in the original flasks as imported. The mode of obtaining the finest kinds is by gentle pressure of the fruit. The cake is afterward treated with hot water, from the surface of which an inferior quality is skimmed. The Gallipoli oil is obtained by allowing the olives to ferment in heaps, and then pressing them in powerful oil-presses; the cake or *marc* is then treated with water once or twice, until all the oil is removed; this inferior oil is darker in color, being a yellowish or brownish green. We receive the finest from Italy, and the commoner qualities from the Levant, Mogador, Spain, Portugal, and Sicily.

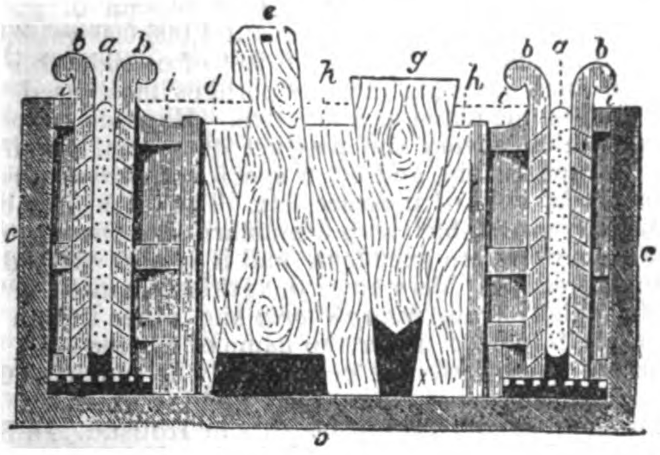

Fig. 1.

Nearly all the other liquid vegetable oils of this class are obtained from seeds, and as they are most of them treated in the same way one description will suffice. First, the seeds are ground—usually by vertical stones (see MILL, fig. 4)—into a kind of coarse meal, which is first warmed in pans, and then put in certain portions in woolen cloths or bags, so arranged as to be of uniform thickness; these are again wrapped in horse-hair cloths, and each parcel is placed between two flat boards slightly fluted on their inner sides, and then placed in the wedge-press (fig. 1). In this *a, a* are two flannel bags filled with the meal and inclosed in horse-hair bags, each flattened between the flat boards, *b, b, b, b*. They are set upright between the pressing-plates, *i, i, i, i*, one at each end of the press-frame, *ccc*, which is made of great strength, and often of cast-iron; its section is seen in fig. 2. Next is placed the wedge *d;* the other wedge, *e*, is then suspended by a cord in the position represented; *h*, *h* are then placed, as seen in the drawing; the main wedge, *g*, is lastly inserted, and the press is ready for action. The operation is very simple; a heavy wooden stamper, 500 to 600 lbs. weight, is raised by machinery about two ft., and allowed to fall upon the wedge *g*. This tightens all the other wedges and pressing-plates, and exerts a pressure of about 60 tons on each bag when fully driven home. The pressing-plates, *i*, *i*, *i*, *i*, are pierced with holes, and so are the plates *b*, *b*, *b*, *b;* and through these holes the oil trickles and passes away by the pipe, *k*, shown in fig. 2.

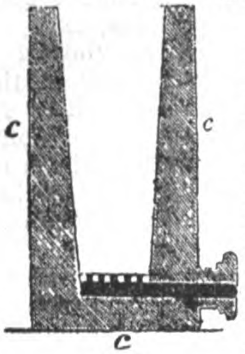

Fig. 2.

One of the chief seed-oils is that of Linseed (q.v.). It is of dark color, specific gravity ·940, boiling point 600° F., and solidifies at a little below 0° F. It possesses the power of dissolving sulphur; on long heating it may dissolve one-quarter its weight, and become thick and dark-colored, forming what has been termed fatty balsam of sulphur. While much oil is made here, about 1,000,000 gallons are imported annually. It is the subject of considerable adulteration, rosin oil being the one perhaps most used. The oil is used in medicine as a laxative. Rape or colza oil is a name which covers the product of several cruciferous seeds, as rape, turnip, and other species of *Brassica*, radish, *Sinapis toria*, gold of pleasure, etc. The oil is clear brown and usually sweet, but with a mustard-like flavor; its illuminating powers are excellent, and it is also well adapted for wool-dressing. Very large quantities are made in Great Britain, chiefly from *Sinapis toria* and other Indian mustard seeds, imported under the name of Surzee seed. The imports of these seeds are occasionally as much as 60,000 quarters per annum. Hemp seed yields a green oil much used in making soft soap, especially in Holland. In Russia it is eaten with various kinds of food, and is greatly liked by all classes.

Cotton-seed oil is now made on an immense scale in the United States. It resembles olive oil, and is used as a substitute for or adulterant of it. It is also employed in the manufacture of soaps, candles, fictitious or vegetable lard, and other varied products. It has acquired a standing such as to raise the waste cotton seed from the gins of the southern states to a most important place in the industrial world.

The following are the names of a number of oils more or less in use. Palm-nut oil, a clear limpid oil from the hard nut of the oil-palm; this nut was formerly rejected as useless after the oil had been obtained from the fruit. Safflower-seed oil, from the seeds of *Carthamus tinctorius;* it constitutes the real Macassar oil. Sunflowerseed oil, from seed exported from the Black Sea provinces of Russia; a rapidly increasing trade is springing up in this excellent oil. Poppy-seed oil, from the seed of *Papaver somniferum*, largely exported from India; it is as sweet as olive oil, and is extensively substituted for it, especially in France, where also it is very largely cultivated. Gingelli-seed oil, from the seed of *Sesamum orientale*, an important Indian staple; the oil is much used for wool dressing, etc. Ground-nut oil, from the seeds of *Arachis hypogæa*, exported from w. Africa and India; this oil is adapted particularly for fine machinery, as it is not affected by cold. Niger, til, or teel-seed oil, from the seeds of *Guizotia oleifera*, much exported from Bombay. Croton oil, from the seeds of *Jatropha curcas*, largely used in wool dressing. The croton oil used in medicine is from *Croton tiglium*, of which only small quantities are exported; whereas of the other many hundred tons, besides seed in large quantity, are exported in one year. Another highly valuable medicinal oil, Castor-oil (q.v.), is of great commercial importance. Almond oil, used chiefly for perfumery purposes, is made from the kernels of the sweet and bitter almond; it is the most free from flavor and odor of any oil in use, notwithstanding that the essential oil of bitter almonds is so strongly flavored.

Oils made from the seeds of the following plants have some commercial value in various countries: *Madia sativa; Argemone Mexicana;* various species of gourds; garden cress (*Lepidium sativum*); tobacco, now extensively used in s. Russia, Turkey, and Austria; hazel-nuts; walnuts; nuts of stone pine; pistachio nut; tea-seed; this in China is a common painter's oil; the grape, from the seeds or stones, as they are called, saved from the wine-presses, used in Italy; Brazil-nut (*Bertholetia excelsa*); *Calophyllum inophyllum*, called Pinnacottay oil in India; *Melia azadirachta*, called in India by the names Neem and Margosa oil; *Aleurites triloba*, called in India, Country Almond oil, and much used for burning in lamps and torches; *Psoralea corylifolia*, called Baw-chee-seed oil. Ben-seeds (*Moringa Pterygosperma*); Bonduc-nuts, the seeds of *Guilandina bonduc* and *G. bonducella*.

The following oils, new to European and American commerce, were shown in the International Exhibition 1862. *India.*—Teorah oil, from the seeds of *Brassica erucastrum;* Capala oil, from the seeds of *Rottlera tinctoria;* Cardamom oil, from the seeds of *Elettaria Cardamomum;* Hidglee Badham oil, from the seeds of *Anacardium occidentale*, or Cashew-nut, now largely cultivated in India; Cassia-seed oil; Chaulmoogra oil, from the seeds of *Hydnocarpus odorata;* Cheerongee oil, from the seeds of *Buchanania latifolia;* Chemmarum oil, from the seeds of *Amoora rohituka;* Circassian-bean oil, from the seeds of *Adenanthera pavonina;* Hoorhoorya oil, from the seeds of *Polanisia icosandra;* Custard Apple-seed oil, from the seeds of *Anona squamosa;* Exile oil, from the seeds of *Cerbera Thevetia;* Monela-grain oil, from the seeds of *Dolichos* *uniflorus;* Kanari oil, from the seeds of *Canarium commune;* Khaliziri oil, from the seeds of *Vernonia Anthelmintica;* Malkungunnee oil, from the seeds of *Celastrus paniculatus;* Bakul oil, from the seeds of *Mimusops elengi;* Rana oil, from the seeds of *Mimusops Kaki;* Moodooga or Pulas oil, from the seeds of *Butea frondosa;* Nahor or Nageshur oil, from the seeds of *Mesua ferox;* Hone-seed oil, from seeds of *Calophyllum calaba;* Poonga, Caron, or Kurrmig oil, from the seeds of *Pongamia glabra;* Vappanley oil, from seeds of *Wrightia antidysenterica;* Babool oil, from seeds of *Acacia Arabica;* Gamboge oil, from seeds of the Gamboge-tree (*Garcinia pictoria*); Coodiri oil, from the seeds of *Sterculia fœtida;* Kikuel oil, from the seeds of *Salvadorea persica;* Marotty, Surrate, or Neeradimootoo oil, from the seeds of *Hydnocarpus inebrians;* and Pundi-kai oil, from the nutmegs of *Myristica malabarica.*

From Brazil.—Oils from the seeds of *Feuillea cardifolia, F. monosperma, Anisosperma passiflora, Cucurbita citrullus, Mabea fistuligera, Anda gomesii, Myristica bicuhiba, Carpotroche Brasiliensis, Dipterix odorata, Theobroma cacao, Acrocomia sclerocarpa, Nectandra cymbarum,* and from the fat of the alligator and the tapir, all for medicinal and perfumery purposes; and oils from the seeds of *Œnocarpus Bacába, Œ. patauá, Caryoca Brasiliensis,* and *Euterpe edulis,* used for culinary and lighting purposes.

From British Guiana.—Oil drawn from the stem of *Oreodaphne opifera;* it resembles refined turpentine. Wallaba oil, from the wood of the Wallaba-tree (*Eperera falcata*), medicinal. Other oils have become known at various international exhibitions. For preparation of the essential oils, see PERFUMERY.

During the fiscal year ending 1889, June 30, the importations of oils into the United States were: whale and fish oils, 455,865 gallons, value $115,862; other animal oils, 18,490 gallons, $3,677; olive oil, 893,338 gallons, $696,065; other fixed or expressed vegetable oils, 843,837 gallons, $395,490; and volatile or essential oils, 630,232 gallons, $146,481. The exports were: lard oil, 861,303 gallons, $542,897; sperm oil, 98,832 gallons, $69,628; other whale and fish oils, 483,208 gallons, $127,412; all other animal oils, 558,080 gallons, $377,919; cotton-seed oil, 2,690,700 gallons, $1,298,609; linseed oil, 72,451 gallons, $42,759; volatile or essential oils, value, $188,603.

OIL-WELLS: OIL-TRADE: see PETROLEUM.

-OIN, suff. *-oyn:* in *chem.*, bearing a slight resemblance to; distantly connected with.

OINTMENT, n. *oynt'mĕnt* [OF. *oignement*, an anointing, an unguent—from OF. *ongier;* F. *oindre*, to anoint—from L. *ungĕrĕ*, to anoint: F. *oint*, anointed—from L. *unctus*, smeared with oil, anointed]: any soft fatty substance or compound, used for smearing or anointing the body, especially a diseased part.

OIRIR-GAEL: name which, in the early times of Scottish history, was applied to the Gaels of the coasts, in distinction from the Gall-Gael or islesmen. There was long a struggle for superiority between these two races, represented respectively by Somerled of the Isles and the later kings of Man, in which the latter were eventually successful, uniting under one head the dominion of Argyle and the Isles.

OISE, *wâz:* river in France, a chief affluent of the Seine; rising in the vicinity of Rocroy, in the n. of the dept. of Ardennes, and flowing s.w., joining the Seine at Conflans-Sainte-Honorine, after a course of 150 m., for the last 75 of which it is navigable. The fall of the river is very gradual, and its course extremely sinuous. It is connected by canals with the Somme, the Sambre, and the Scheldt, and forms one of the chief commercial routes between Belgium and Paris. It becomes navigable at Chauny.

OISE: department in n. France, bounded e. by the dept. of Aisne, and w. chiefly by that of Seine-Inférieure, which intervenes between it and the English Channel; area, 2,250 sq. m., of which two-thirds are in arable land; pop. (1881) 404,555. The principal rivers are the Oise—from which the dept. derives its name—and its tributaries the Aisne and Therain. The dept. is almost wholly included in the basin of the Oise; and as the course of that river indicates, the surface—consisting for the most part of extensive plains—has a general slope toward the s.w. The soil is in general fertile, and agriculture is well advanced. The products are the usual grain-crops, with an immense quantity of vegetables, which are sent to the markets of the metropolis. The dept. is divided into the four arrondissements Beauvais, Clermont, Compiègne, Senlis; cap. Beauvais.

OITI (*Moquilea tomentosa*): tree of the nat. order *Chrysobalanaceæ*—by many botanists regarded as a sub-order of *Rosaceæ* (q.v.)—native of n. Brazil, and valuable on account of its timber, which is very good for ship-building.

OJIBWAYS, *ō-jĭb'wāz*, or CHIP'PEWAS: tribe of N. American Indians of the great Algonquin family, living in scattered bands on the shores of Lakes Superior and Huron. The French explorers found them on the n. shore of Lake Huron 1640, a band of 2,000 being at Sault Ste. Marie, from which they were called Sauteux, a name they still bear among the Canadian French. Here the Jesuit Fathers established a mission 1642. The O. are a tall, well-developed, brave, hardy people, fond of war and hunting, but little given to agriculture. They have been at war with the Sioux, Iroquois, and Foxes from early times. War so reduced them that on the restoration of the French missions 1660 only 500 O. were found in four bands at the Sault. They were warm allies of the French to the close of French rule. They were allies of the British in the revolutionary war and in the second war with England; but made peace with the Americans by the treaties of 1785, 89, 95, and 1816. Some had moved as far e. as Lake Erie, but gave up most of their lands in Ohio 1817. In 1822 there were 5,669 O. at Saginaw, 8,335 along the Lake Superior line from Mackinaw to the Mississippi, and 500 mixed with other tribes. The limits of their vast territory were fixed by treaty 1825. They gradually ceded their lands to the govt., and 1837 and 42 the United States agreed to pay them for 25 yrs. $260,200 in money, goods, and other forms. By 1851 all but a few bands had been removed w. of the Mississippi river, while those remaining ceded all except moderate reservations. Their total number 1866 was 14,000, at various stages of civilization and improvement. The Lake Superior and Michigan bands were generally peaceful, industrious, and advancing in cultivation. The Red Lake band were chiefly hunters. The O. of the Mississippi river still possess large tracts of land, and many others are scattered on reservations amounting to more than 5,000,000 acres, as provided by treaties 1854–67. There are also many O. in Canada. The early Rom. Cath. missions are still maintained; there are also Prot. missions. The customs, traditions, language, and religion of the O. are better known than those of any other tribe.

O'KA: important commercial river of central Russia, principal affluent of the Volga from the south. It rises in the govt. of Orel, and flows generally n e., forming a common boundary between the govts. of Tula, Kaluga, and Moscow; and afterward flowing through the govts. of Riazan, Vladimir, and Nijni-Novgorod. It joins the Volga at the city of Nijni-Novgorod, after a course of 837 m. Its basin, estimated at 127,000 sq. m., comprises the richest and most fertile region of Russia. The principal towns on its banks are Orel, Beleff or Bielev, Kaluga, Riazan, and Murom; the most important affluents are the rivers Moscow, Kliasma, and Tzna. During spring the Oka is navigable from Orel to the Volga; but in summer the navigation is obstructed by sandbanks. It communicates with the ports on the Baltic, Caspian, and White Seas; and the cargoes annually shipped down the river amount in value to many millions of dollars.

OKE, n. *ōk* [Turk.]: Turkish and Egyptian weight, equal to about $2\frac{3}{4}$ lbs.: Hungarian and Wallachian measure of capacity, equal to about $2\frac{1}{2}$ pints.

OKEECHOBEE, *ō-kē-chō'bē*, LAKE: largest lake in the s. part of the United States: it is in the s. part of Fla., s. of Brevard co. and between Manatee and Dade cos.; greatest length about 40 m., greatest width 25 m.; greatest depth variously stated 12 to 20 ft.; area 1,200 sq. m. It is for the most part inaccessible, owing to the swampy and impenetrable jungle which almost encircles it. It receives the waters of several streams, the Kissimee being the largest, and its waters are doubtless drained into the Everglades to the s., though no outlet has been discovered. But few fish are found. There are several low islands in it, which were formerly said to contain ruined buildings, but that report is not now believed. The lake has recently been partly drained.

OKEFINOKEE, *ō-kē-fĭ-nō'kē*, SWAMP: one of the largest swamps in the United States; in Chariton, Ware, and Clinch cos. in s. Ga., and Baker co. in n. Fla.; about 40 m. long, 30 m. wide; 500,000 acres. It has a large extent of heavy forest timber, other portions being partly overgrown with weeds, vines, and bushes. Alligators, rattlesnakes, and moccasins abound, and many species of game birds are found. The e. part is a lake about 12 m. wide, dotted with floating islands or *prairies tremblantes.*

O'KEL'LY, JAMES: 1757–1826, Oct. 26; b. Ireland. His youth is involved in obscurity. He was one of the early Methodist preachers in America, beginning his work in the middle of the revolutionary war. He was admitted into the travelling connection 1778, ordained elder at the organization of the M. E. Church 1784, and was a member of the council of presiding elders at Baltimore 1789, Dec. 1. His opposition to certain measures of the council did much to discredit such bodies; the second called by Bp. Asbury being poorly attended, and the third called was never held. O'K. labored hard for a general conference, and he succeeded in bringing it about. His desire to curtail the power of Bp. Asbury led him to offer a resolution in general conference 1792, that any preacher might appeal from the bp.'s appointment to the general conference. The resolution was lost, and O'K. with a few supporters withdrew from the conference and organized the Republican Methodist Church, afterward called the Christian Church. This secession gained 1792–98 about 8,000 members; but divisions and subdivisions reduced it; and 20 years later little remained of the organization. O'K.'s ministry was mainly in the s. counties of Va. and the border counties of N. C. He was vehemently opposed to negro slavery, protesting against it privately and from pulpit and press.

OKEN, *o'kĕn* (originally OCKENFUSS, *ok'kĕn-fôs*), LORENZ: famous German naturalist: 1779, Aug. 1—1851, Aug. 11; b. Bohlsbach, Würtemburg. He studied at Würzburg and Göttingen; became extraordinary prof. of medicine at Jena 1807, where his lectures on nat. philosophy, nat. history, zoology, comparative anatomy, vegetable and animal physiology, attracted much notice. In 1812 he was appointed ordinary prof. of nat. science; and in 1816 commenced the publication of a journal partly scientific and partly political, called *Iris*, which continued till 1848. The opinions promulgated in the *Iris* led to govt. interference, and O. resigned his chair and became a private tutor, giving his leisure to the composition of works on nat. history. In 1828, he obtained a professorship in the newly-established Univ. of Munich; but in 1832 exchanged it for another at Zürich, where he died. O. aimed at constructing all knowledge *a priori*, and thus setting forth the system of nature in its universal relations. The two principal works in which this idea is developed are *Lehrbuch der Naturphilosophie* (Jena 1808–11), and *Lehrbuch der Naturgeschichte* (3 vols. Leip. 1813–27). The former has been translated into English, and published by the Ray

Soc. under the title *Elements of Physio-philosophy*. As O.'s philosopic system of nature was very peculiar and quite unlike anything that had preceded it, O. invented a nomenclature of his own, which, however, in many cases is forced and pretentious, composed of words mostly newly-coined and difficult to remember. It therefore found little favor, and O. was long regarded—particularly by French and English savans—as a mere dreamer and transcendental theorist; nor can it be denied that he is to a large degree such, infected with the worst vices of the school of Schelling, to which he belonged; but some of his 'intuitions'—if we may so term his scientific suggestions—were remarkably felicitous, and in the hands of rigorous demonstrators, have led to great results. In his work *Die Zeugung* (On Generation, Bamb. 1805), he first suggested that all animals are built of vesicles or cells; in his *Beitrage zur vergleichenden Zoologie, Anatomie und Physiologie* (1806) he pointed out the origin of the intestines in the umbilical vesicle; and in the same year lighted accidentally upon the idea, since so prolific of results, that the bones of the skull are modified vertebræ. On account of this discovery he has been termed 'the father of morphological science.' That O., and not Göthe, was the original discoverer of the vertebral relations of the skull has been conclusively shown by Owen, in a valuable notice of O. in *Encyc. Britannica.*

OKHOTSK, *ō-čhŏtsk′* or *ŏk-hŏtsk′*, SEA OF: extensive inlet of the n. Pacific Ocean, on the e. coast of Russian Siberia. It is bounded n. by the wastes of Siberia, e. by the peninsula of Kamtchatka, and is partially inclosed by the Kurile Islands on the s. and by the island of Saghalien on the w. It is 1,000 m. in length, and 500 m. in breadth. The river Ud, which enters it on the n., is 400 m. long. Climate and position will probably prevent the Sea of O. from ever becoming the scene of much commerce. On its n. shore, at the mouth of the Okhota—from which it derives its name—is the small seaport of Okhotsk, lat. 57° 21′ n., long. 143° 17′ e. (pop. 236): it has been entirely superseded by the ports of Nikolaevsk and Vladivostok.

OKLAHOMA, *ŏk-la-hō'ma* or *ōk-lâ'hō-ma* ('beautiful land'): territory, opened to settlement 1889, very irregular in form, in the central portion of the Indian Territory; bounded n. by the Cherokee outlet; e. by the Iowa, Kickapoo, and Pottawatomie reservations; s. by the Cheyenne and Arrapahoe reservations; the long and irregular s.w. line is formed by the Canadian river; and on the n.w. the Cimarron flows for a short distance; area 1,887,796 acres. There are high prairies crossed by numerous streams; but in some portions the water has alkaline properties. The rainfall is similar to that of w. Kan. There are a few points at which the soil is extremely poor and other localities in which there is good land but poor water. Some of the elevated plains are subject to drought, but there is a large extent of excellent farming land, especially in the vicinity of streams, and extensive areas suitable for pasturage. There is supposed to be considerable mineral wealth in O., but on account of the brief period it has been occupied by parties interested in learning its capacities, the extent of its riches in this direction is unknown. But it is certain that coal abounds in the valley of the Canadian river, and within the limits of O. there are deposits of iron and copper ores, and probably small quantities of silver and gold. Along the streams and in the larger valleys there is abundance of timber, and occasional patches of trees suitable for fuel or lumber appear on the prairies. During most of the year the climate is delightful. The mean annual temperature ranges from 55° to 60°, and in winter the mercury seldom falls as low as 20°. The Atchison Topeka and Santa Fé railroad passes through O. nearly n. and s., and other roads reach points not distant.

The O. region has been known to white men since 1662 when the Spanish explorer Don Diego Dionisio de Penalosa passed through it on his way to the north. He reported 'pleasing, peaceful, and most pleasant fields,' with trees and rivers, fruits and flowers. It was part of the Lousiana tract purchased of France 1803, and was included in the large area set apart for Indian tribes 1834. Though it was known that the early reports of the beauty and fertility of the region were exaggerated, it has long been regarded as a very desirable place for settlement, and many efforts have been made to secure legislation for the removal of the Indians and the opening of the country as public land. The govt. had obtained by purchase 1866 a large area from the Creeks and Seminoles (see INDIAN TERRITORY), on the claim that more land was needed on which to locate certain Indian tribes and freedmen; but had never used it for the purpose designated. Notwithstanding the treaty restrictions concerning the future occupants of the area, the claim was made and extensively circulated that all Indian rights to the land had been extinguished by purchase, and that, in common with all other public land, it was, under the Homestead Act as modified 1879, subject to pre-emption. It was also claimed that the land had been fenced and was occupied by parties who were keeping immense herds of cattle thereon; and that intending settlers desiring homes had stronger claims than the cattle owners. The statement was widely published that the O. region was unquestionably public land, and an unorganized company of people from the states adjoining the Indian Territory entered the domain 1879, Apr., intending to locate permanently. The pres. of the United States notified such intruders to withdraw, and in case of their refusal to obey ordered that they be removed. Another proclamation, issued the next year, was followed in a few weeks by an organized colony which left Arkansas City, Kan., 1880, Apr. 13, under the lead of Capt. David L. Payne, selected a location, laid out a town covering six sq. m., and began to build. The following month the company was removed from the territory by U. S. soldiers. After a brief period of imprisoment, Payne and his men were discharged and warned not to repeat the offense for which they had been committed. A few weeks later Payne and a still larger party were arrested on the forbidden ground, and treated as the previous party had been. Still another party, numbering about 200, with the same leader, prepared to enter the region in the winter of 1880-81, and was disbanded by U. S. troops. Payne was tried on a civil process 1881, and convicted. But the laws punished the crime only by a fine, which in this case, as it could not be collected, had no terrors for the offender. Several other expeditions, led by Payne, entered the region and were promptly expelled, but the number and enthusiasm of the invaders steadily increased. Surveys were made, town lots were laid out, and in the aggregate large sums of money were paid to Payne and other leaders of the movement. Certificates purporting to give the holder a legal claim to 160 acres of land in O. were sold to many people who did not design to locate there, but who purchased shares merely as an investment. Another class of certificates entitled the purchaser to certain rights in the organization of the government of the colony of which he was a member. After the death of Payne 1884, Nov. 28, the invasions were continued under the lead of W. L. Couch. An armed force defied the govt. officials; but was expelled 1885, and the leaders were arrested on a charge of insurrection; but the case against them was never brought to trial. Although the pres. issued a proclamation 1885 to the effect that the govt. would maintain the position already taken in regard to the settlement of the disputed area in the Indian Territory, incursions continued with considerable frequency till 1887. Meanwhile action had been taken by congress with a view to arrange with the Indians for the opening of the unoccupied lands for settlement under the Homestead Act. Terms were at length agreed on, and early in 1889 treaties were concluded with the interested tribes. A proclamation was then issued by the pres., stating the bounds of the new territory which was to be established, and declaring that 1889, Apr. 22, at noon, the unassigned lands would be open for settlement. Any person locating upon the territory before that date was to be debarred from ever acquiring a title to the land. Four days before the date of opening the lands, people were allowed to cross the Cherokee outlet. Vast crowds collected near the O. boundary, and when the pre-arranged signal of a bugle blast was given they rushed across the line. During the next few hours more than 50,000 people entered the territory, several towns were laid out, and thousands of tents and portable houses were erected. The laws concerning the securing of homesteads had been arranged by congress 1889, Mar. 2, to facilitate the entering of claims, land offices had been opened, and a govt. force of infantry and cavalry had been detailed to keep order and prevent the intrusion of parties before the appointed hour. The bringing of intoxicating liquors into the Indian Territory had been strictly prohibited, and the order was rigidly enforced. Though wild and impetuous, the entrance into the region was almost wholly free from the quarrels and bloodshed which had been feared. The civil govt. of the territory was vested in the U. S. court, which had jurisdiction over the Indian Territory. In several of the principal settlements, municipal organizations were formed, officers elected, and arbitrators chosen to act in place of courts till the latter could be legally constituted. In less than six months from the opening of the region to settlement, the town of Guthrie had six banks, one of which commenced doing business in a tent on the first afternoon the territory was opened, four daily newspapers, a system of water-works, and both electric light and street car companies. Before 1890, Jan., there had been established in O. 38 churches, 29 schools, and 22 newspapers. There were 28 towns, of which the larger were Guthrie (pop. 8,000) and Oklahoma City (pop. 5,000). A bill to establish a territorial govt. was considered in the senate 1890, Feb. 5, passed the house Mar. 13, and the act was approved by the pres. May 2. The pres. appointed George W. Steele of Ind. gov. of the territory May 8, and the appointment was confirmed by the senate May 14. J. C. Delaney was appointed receiver of the public money 1890, June 18. Pop. of the territory (1889, Dec., reported by the sec. of the interior) 60,000.

OKRA, n. *ō'krǎ*, and OKRO, n. *ŏk'rō:* a plant of the W. Indies, whose pods are used as pot-herbs and for pickles; the *Abelmos'chus esculen'tus.* See HIBISCUS.

OKUBO, JUSAMMI TOSHIMICHI: Japanese statesman: b. Satsuma, about 1829. He held a position under the prince of Satsuma, was made a national councilor on the abdication of the tycoon 1868, visited America 1872, crushed a rebellion at Saga 1874, was afterward ambassador to China, and has served as minister of the interior. He has taken much interest in schools and in the development of the agricultural resources of the empire.

OKUMA SHIGENOBU: Japanese statesman: b. Hizen, Kiushiu, 1837. He became familiar with the Dutch and English languages, entered political life 1868, in the dept. of foreign affairs, became assistant in the interior and financial departments 1869, and a councilor 1870. He was with the Formosa expedition, again became financial minister 1872, and attended the Vienna exposition 1873 as pres. of the Japanese commission.

-OL, suff.: in *chem.*, suffix terminating compounds which are true alcohols; thus phenol, phenylic alcohol.

OLAF, *ō'lâf*, SAINT: one of the most revered of the early Norwegian kings: 995–1030 (reigned 1015–30). Having distinguished himself by gallant exploits, and made his name a terror in several warlike expeditions on the coasts of Normandy and England, he succeeded 1015 in wresting the throne of Norway from Eric and Svend Jarl. The cruel severity with which he endeavored to exterminate paganism by fire and sword alienated the affection of his subjects, many of whom sought security from his persecution in the territories of Knut or Canute the Great, King of Denmark; and it was only through the powerful aid of his brother-in-law, the Swedish Anund Jacob, that his authority could be upheld. O.'s hot-headed zeal, however, after a time exhausted the patience of the people, who hastened to tender their allegiance to Knut, on his landing in Norway 1028, when O. fled to the court of his brother-in-law, Jaroslav of Russia, who gave him a band of 4,000 men, at the head of whom he returned 1030 and gave Knut battle at Stiklestad, where O. was defeated by the aid of his own subjects and slain. The body of the zealous king, which had been left on the field of battle and buried on the spot by a peasant, having (as was believed) begun to work miracles, his remains were carefully removed to the cathedral of Trondhjem, where the fame of their miraculous power spread far and wide, attracting pilgrims from all parts of the Scandinavian peninsula. O. was solemnly proclaimed patron saint of Norway in the succeeding century; and till the Reformation his name continued to gather a rich assemblage of mythical legends and popular sages, the memory of which still lingers in the folk-lore of Norway. In 1847 the order of Olaf was created, in honor of the saint, by King Oscar I. of Sweden and Norway.

O'LAND: see ŒLAND.

OLBERS, *ŏl'bĕrss,* HEINRICH WILHELM MATTHIAS: famous German physician and astronomer: 1758, Oct. 11—1840, Mar. 2; b. Arbergen, a small village of Bremen. He studied medicine at Göttingen 1777–80, and commenced practice at Bremen, where, both as physician and as man, he was highly esteemed. In 1811 he was a successful competitor for the prize proposed by Napoleon for the best 'Memoir on the Croup.' O. wrote little on medical subjects; for from 1779 all the leisure which he could abstract from professional occupations was given to enthusiastic study of astronomy. The first thing which brought him into notice was his calculation of the orbit of the comet of 1779, performed by him while watching by the bedside of a sick patient, and was found surprisingly accurate. Comets were the chief objects of his investigation, and he seems to have had an irresistible predilection for these vagabonds of the solar system, which his two important discoveries of the planets Pallas (1802) and Vesta (1807) could not diminish. In 1781 he had the honor of first rediscovering the planet Uranus, which had previously been supposed, even by Herschel himself, to be a comet, and which had been sought for in vain. He also discovered five comets in 1798, 1802, 04, 15, and 21, all of which, except that of 1815 (hence called *Olbers' comet*), had been some days previously observed at Paris. His observations, calculations, and notices of various comets, which are of inestimable value to astronomers, were published in the *Annuaire of Bode* (1782–1829), in the *Annuaire of Encke* (1833), and in three collections by the Baron de Zach. Most of these calculations were made after a new method, discovered by himself, for determining the orbit of a comet from three observations: a method which for facility and accuracy he considered greatly preferable to those then in use. A detail of it appeared in a journal published at Weimar (1797), and a new edition by Encke 1847. O. was one of that small band of astronomers which included Schröter, Gauss, Piazzi, Bode, Harding, etc., who in the first ten years of the 19th c. devoted their energies to the observation of those planets which were coming to light between Mars and Jupiter. As above stated, two of them, the second and fourth in order of discovery, were detected by O. himself; and the general equality of the elements of the four planetoids led him to propound the well-known theory that these and the other Planetoids (q.v.) since discovered are but fragments of some large planet which formerly revolved round the sun at a distance equal to the mean of the distances of the planetoids from the same luminary. It was this theory which led him, after the discovery of Pallas, to seek for more fragments of the supposed planet, a search resulting in the discovery of Vesta. O. also made important researches on the probable lunar origin of meteoric stones, and invented a method for calculating the velocity of falling stars. He died at Bremen; and 1850 his fellow-citizens erected a marble statue in honor of him. O., as a writer, had great powers of thought, with equal clearness and elegance of expression. His valuable dissertations are scattered through various journals.

OL'COTT, Simeon: 1735, Oct. 1—1815, Feb. 22; b. Conn.: lawyer. He graduated at Yale College 1761; settled in Charlestown, N. H.; became chief-justice of the common pleas court 1784, judge of the superior court 1790, and chief judge of the latter 1795; and was U. S. senator 1801–5.

OLD, a. *ōld* [AS. *eald;* Ger. *alt;* Goth. *altheis,* old: radical meaning probably *grown up*—from Goth. *alan;* Icel. *ala;* L. *alĕrĕ,* to nourish]: far advanced in years; aged; used of any length of time, as, how *old* is he? he is two years *old;* decayed or injured by time or long use; out of date; not new or fresh; in *OĔ.*, more than enough; superabundant. **Old'ness**, n. *-nĕs,* state of being old. **Old'ish**, a. *-ĭsh,* rather old. **Olden**, a. *ōld'ĕn,* applied to time long past; ancient. **Old-fashioned**, a. antiquated; formal. **Old age**, decline of life; advanced years. **Old-clothesman**, a man who collects half-worn-out garments, and old attire of all kinds, to be sold when repaired and renovated. **Old men's workings**, mines or underground excavations that have been formerly worked. **Of old**, long ago; in anc. times. **Old bachelor**, an unmarried man somewhat advanced in years. **Old maid**, an unmarried woman no longer young. **Old said**, long since said. **Old school**, a party belonging to a former time, or a party having the character and opinions appropriate to former times. **Old song**, a mere trifle; a nominal price. **Old wife**, a prating old woman; a man having some of the characteristics and habits peculiar to old women; in *Scot.*, an apparatus for curing smoky chimneys. **Old Red Sandstone**, the whole series of strata below the Coal-measures and above the Silurian system (see below). **Old Testament**, the earlier portion of the Scriptures, B.C. **Old Style**, the old mode of reckoning time according to the Julian year of 365¼ days—by the New or Gregorian Style, the year is 365 d. 5 h. 49 m.; there is now a difference of 12 days between New and Old Styles—thus, while the former is Jan. 13, the latter is only Jan. 1. **Old Tom**, a kind of strong London gin; a particular manufacture of Scotch whisky, matured by long keeping. **Old world**, Europe, Asia, Africa, as distinguished from America or the New World.—Syn. of 'old': ancient; antique, antiquated; aged: elderly; obsolete; pristine; original; primitive; old-fashioned.

OLDBURY, *ōld'bėr-ĭ:* important manufacturing town of England, co. of Worcester, 29 m. n.n.e. of the city of Worcester, 5 m. w. of Birmingham; on the river Tame, and on the Birmingham canal, and the London and Northwestern and the Great Western railways. It contains numerous churches, meeting-houses, and schools. The extension of the iron-trade has greatly increased its size and prosperity in recent years. There are coal and iron mines in the neighborhood: and in the town, iron, steel, locomotive engines, mills, edge-tools, draining-pipes, etc., are made. The Stour Valley railway passes close by the town, and there is a station here. Pop. (1871) 16,410; (1881) 18,821.

OLDCASTLE, *ōld-kăs'sl*, Sir JOHN: died 1417: formerly known as the 'good Lord Cobham'; whose claim to distinction is that he was the first author and the first martyr among the English nobility: b. in the reign of Edward III.: the year is not known. He acquired the title Lord Cobham by marriage. He had high repute as a soldier, was a personal friend of Henry IV., and commanded the Eng. army in France 1411 which forced the Duke of Orleans to raise the siege of Paris. He was ardently attached to the doctrines of Wickliffe. At that time there was a party among the English nobles and gentry sincerely and even strongly desirous of ecclesiastical reform—the leader of which was 'old John of Gaunt—time-honored Lancaster.' O. was active in the same cause, and took part in the presentation of a remonstrance to the English commons on the subject of the corruptions of the church. At his own expense he had the works of Wickliffe transcribed and widely scattered among the people, and paid a large body of preachers to propagate the views of the reformer throughout the country. In the reign of Henry V. O. was accused of heresy and of harboring the 'poor preachers' or Lollards (q.v.); and having in a disputation with his sovereign declared that, 'as sure as God' s word is true, the pope is the great Antichrist foretold in Holy Writ,' he was thrown into the Tower, whence, after some time, he escaped, and concealed himself in Wales. He had indeed publicly refused his assent to the doctrine set forth by the church on the Eucharist, penance, image worship, and pilgrimages. The king had in vain urged him to save himself by recanting, and at last permitted the bishops to proceed against him. A bill of attainder was passed against him, and 1,000 marks set upon his head. After four years' hiding he was captured, brought to London, and—being reckoned a traitor as well as a heretic, for at his escape the Lollards had risen in revolt—he was hung up in chains alive upon a gallows, and fire being put under him, was slowly burned to death 1417. O. wrote *Twelve Conclusions addressed to the Parliament of England*, several monkish rhymes against 'fleshlye livers' among the clergy, religious discourses, etc. The severe morality and the anti-ecclesiasticism of O. drew on him the popular contempt; and the idea of Gairdner, advocated by Halliwell and others, that Sir John O. was the original of Shakespeare's Sir John Falstaff, has much probability.

OLD CATH'OLICS: title assumed by a number of members of the Church of Rome who, at Munich, protested against the new dogma proclaimed by the Vatican Council, 1870, July 18, of the personal infallibility (see INFALLIBILITY) of the pope in all *ex cathedrâ* deliverances: and now designating a communion or church, in Germany and Switzerland, not large in numbers, but comprising some men eminent in Christian scholarship. The Munich protest by 44 professors, Dr. Döllinger (q.v.) and Prof. Friedrich (q.v.) at their head, was directed against the binding authority of the Vatican Council and the validity of its decrees. To the Munich protest a number of Rom. Cath. professors at Bonn, Breslau, Freiburg, and Giessen declared their adhesion. The leaders of the movement met at the end of Aug. at Nuremberg, and drew up a declaration. The German bishops, though they had given warning of the dangerous consequences of the proclamation of the new dogma, submitted to the decision of the Vatican Council; and in a pastoral letter 1870, Sep. 10, called on all members of the faculty of Rom. Cath. theology to signify their allegiance. Against the refractory (numerous professors and one priest) they proceeded by suspending them from their functions, and then by excommunication. The Prussian and Bavarian governments, however, took their respective subjects, the objects of those measures, under their protection.

At first, the mass of the priests and laity showed very little sympathy with the Old Catholic movement: only two country congregations declaring their dissent from the decree of the Vatican Council. Pamphlets and appeals, issued by the heads of the party, elicited little response. Local committees in furtherance of the cause were, however, formed in towns of Bavaria and the Rhine country. At a general Old Catholic Congress, Munich, 1871, Sep., it was resolved to draw the bonds of union close with the church of Utrecht, the Jansenists (q.v.) of the Netherlands, a church originating in the 18th c., and which, under an abp. of Utrecht and two bishops of Haarlem and Deventer, now offered to the O. C. the possibility of prelatical consecration and confirmation. The congress, while carefully eschewing any decided breach with traditional dogma, and professing the desire simply to maintain the church as it stood before 1870, July 18, propounded the far-reaching principle, that the decisions of an ecumenical council, to be valid, must be in agreement with the existing faith of the Catholic people and with theological science. The hope also was expressed of a reunion with the Greek Oriental Church, and a gradual understanding with the Protestants. Old Catholic congregations began to be formed in different towns of Bavaria and the Rhine country. In 1872, the Old Catholic priests in the German empire numbered about 30. The abp. of Utrecht, in July, made a tour in Germany, holding religious service in Prot. churches and confirming the children of O. C. At a second congress at Cologne, 1872, Prof. Friedrich declared that the Old Catholic movement was now directed, not merely against papal infallibility, but 'against the whole papal system, a system of errors during a thousand years, which had only reached its climax in the doctrine of infallibility.'

At Cologne, 1873, Prof. Reinkens of Breslau was elected bp. of the O. C. in the ancient fashion, by 'clergy and people'—by all the Old Catholic priests and a deputation of the Old Catholic congregations. He was consecrated at Rotterdam by the bp. of Deventer; and formally acknowledged by the govts. of Prussia, Baden, and Hesse. The Bavarian govt. declined to forbid his journeys for confirmation in their kingdom. The third congress, at Constance, 1873, concerned itself with 'synodal and communal regulations,' and with projects toward union with other Christian confessions. There were numerous guests present, Anglican, Russian, and German Prot. clergy. On the basis of the decrees of this congress, the first Old Catholic Synod was held at Bonn, 1874, of 30 priests and 59 laymen. They laid down principles for reforms in general, abolished auricular confession and compulsory fasting, and appointed two commissions to draw up a new ritual in the popular tongue, and to frame a Catechism and a Bible History.

The progress of Old Catholicism in Germany has been slow. In 1883 there were in the German Empire 34,800 Old Catholics, of whom 16,300 were in Prussia; and about 50 priests. In Switzerland, Old Catholicism has taken firm root, the govt. having from the first protected the priests excommunicated by the bp. of Basel. At Bern, 1874, a special Old Catholic theol. faculty was established. In France, the movement was befriended by Father Hyacinthe (q.v.), though he did not join the Old Catholic Church. Of late there has been a general decline in the movement, with some marked exceptions. There was a slight increase 1883, and in Bavaria decidedly, in consequence of the aggressive acts of ultramontanism; a new church was built and opened. In Lucerne an Old Catholic chh. was formed by laymen, and elsewhere in Switzerland the condition was temporarily affected, one way or the other, in some cantons, by elections; but the Christian Catholics, as they call themselves, maintained their ground, and were strong in their theological faculties. In 1884, there was considerable increase in Heidelberg, Freiburg, Kaiserlautern, Pforzheim, Saarbrück, and in Baden, where the O. C. numbered 7,118, against only 2,286 in 1873. In France, no progress appeared, the congregation of Father Hyacinthe in Paris, about 1,000, holding its own, as did the provincial one. In Spain, 30,000 to 40,000 Protestants desire a bishop and a liturgy, but do not wish to assume the Catholic name. In Italy, the proclaimed papal threat, 1884, Sep. 29, of the greater excommunication against all Rom. Catholics who even attended the Old Catholic services, was turned to good account by Savarese, Campello, and their coadjutors in the reform movement. But not long after this, the cause received a blow in the withdrawal of its great leader, Dr. Döllinger of Munich, who, disgusted with the dissensions that he had to contend with, cut loose from ecclesiastical affiliation. In Germany, the emperor seems to favor all religious and benevolent organizations, and the Prussian chambers, not very favorable, voted, 1888, a grant to the Old Catholic bp. and the new seminary at Bonn; but many of the pastors are drifting back to Rome, or else giving up all clerical functions. In Bohemia, however, the situation is improved, notwithstanding poverty and governmental antagonism. Baptisms, marriages, and interments are reported, showing a cessation of interference by the authorities. The number of congregations, in one year, had increased from 53 to 78. In one village, the people went over *en masse*, so that the empty Rom. Cath. church was granted to the reformed use. But, though the O. C. churches are found in every European country except Belgium, and number about 150,000 souls, it is a kind of doctrinal contest that does not appeal to the ignorant common people, nor enlist liberal persons of culture. The chief hope is in the silent influence of the movement, and the gradual filtering down of reform to the masses.

OLDEN, *ōld'ĕn*, CHARLES SMITH: 1799, Feb. 19—1876, Apr. 7; b. Princeton, N. J.: merchant. He received a limited common school education; began his mercantile career in Philadelphia 1823; was successfully engaged in business in New Orleans from 1826 till 1834; and then retired to his home in Princeton. He became treas. of the College of New Jersey and rendered it large service after the burning of Nassau Hall; was a state senator from 1844 till 1850; was elected gov. of N. J. as a republican 1859; was active in organizing and equipping troops for the Union armies, attended the peace congress 1861, and served as gov. till 1863: and subsequently was a judge of the court of errors and appeals, member of the court of pardons, riparian commissioner, and presidential elector.

OLDENBURG, *ōl′dĕn-berg*, Ger. *ōl′dĕn-bûrćh:* grand-duchy of n. Germany, consisting of three distinct and widely separated territories, viz., Oldenburg Proper, the principality of Lübeck, and the principality of Birkenfeld; total area, 2,461 sq. m.; pop. (1880) 337,478. O. Proper, which comprises seven-eighths of this area and four-fifths of the entire population, is bounded n. by the German Ocean, e., s., and w. by the kingdom of Hanover. The principal rivers are the Weser, the Jahde, and the Haase, Vehne, and other tributaries of the Ems. The grand-duchy of O. Proper is divided into eight circles. The country is flat, belonging to the great sandy plain of n. Germany, and consists mostly of moors, heaths, marsh or fens, and uncultivated sandy tracts; but here and there, on the banks of the rivers, the uniform level is broken by gentle acclivities, covered with wood, or by picturesque lakes surrounded by fruitful pasture-lands. Agriculture and the rearing of cattle are chief sources of wealth. The horses and cattle raised in the marsh-lands are excellent of their kind; and the horse-markets at Oldenburg, and the cattle-sales at Ovelgönne, are frequented by purchasers from every part of Germany. Scarcity of wood for fuel, and absence of coal, are compensated for by vast turf-beds. Except some linen and stocking looms, and a few tobacco-works, there are no manufactories. There are, however, numerous distilleries, breweries, and tan-yards in all parts of the duchy. The trade is principally a coasting-trade, in small vessels, 20 to 40 tons, which can thread their way along the shallow channels connecting the larger rivers. Exports are horses, cattle, linens, thread, hides, and rags, which find their way chiefly to Holland and the Hanseatic cities: imports include the ordinary colonial goods, and manufactures of numerous kinds. The receipts for the collective grand-duchy were in the budget for 1881, $1,752,224; expenditure, $1,850,561. Public debt, at the close of 1880, was $8,945,145.

The principality of Lübeck, consisting of the secularized territories of the former bishopric of the same name, is surrounded by the duchy of Holstein, and is on the banks of the rivers Schwartau and Trave; contributing 199 sq. m. to the general area of the grand-duchy, and 34,961 inhabitants to the collective population. It is divided into four administrative districts. It has several large lakes, as those of Plön—noted for its picturesque beauty—Keller, Uklei, and Gross-Eutin; while in climate, soil, and natural products it participates in the general physical characteristics of Holstein. The chief town is Eutin—pop. (1881) 3,700—pleasantly situated on the lake of the same name, with a fine castle surrounded by a magnificent park.

The principality of Birkenfeld, s.w. of the Rhine, among the Hundsrück mountains, and between Rhenish Prussia and Lichtenberg, is an outlying territory, lat. 49° 30′—49° 52′ n. and in long. 7°—7° 30′ e.; 192 sq. m.; pop. 37,093. The soil of Birkenfeld is not generally productive; but in the lower and more sheltered valleys it yields wheat, flax, and hemp. Wood is abundant. The mineral products, which are of importance, comprise iron, copper, lead, coal, and building-stone; while in addition to the rearing of cattle, sheep, and swine, polishing of stones, especially agates, is the chief industry. The principality is divided into three governmental districts.

O. is a constitutional ducal monarchy, hereditary in the male line of the reigning family. The constitution, based on that of 1849, revised in 1852, is common to the three provinces, which are represented in one joint chamber of 33 members chosen by free voters. Each principality has, however, its special provincial council, the members of which are likewise elected by votes; while each governmental district within the provinces has its local board of councilors, and its several courts of law, police, finance, etc., though the highest judicial court of appeal and the ecclesiastical and ministerial offices are at Oldenburg. Perfect liberty of conscience was guaranteed by the constitution of 1849. The Lutheran is the predominant church, more than 200,000 of the population belonging to that denomination; while about 70,000 persons profess the Rom. Cath. faith. There are two gymnasia, one higher provincial college, several secondary and 500 elementary schools; but in consequence of the scarcity of villages in the duchy and the isolated position of many of the houses of the peasantry, schools are not common in the country districts, and the standard of education of the lower classes is not equal to that in other parts of n. Germany. The military forces of O.—more than 2,000 men on the peace footing—form a portion of the Prussian army. The merchant navy comprises about 350 vessels of 70,000 tons. O. is represented in the Bundesrath or Federal Council of the German Empire by one member, and in the Reichstag or Diet by three members.

History.—The territory now included in the grand-duchy of O. was in ancient times occupied by the Teutonic race of the Chauci, who were subsequently merged with the more generally known Frisii, or Frisians; and the land, under the names of Ammergau and Lerigau, was long included among the dominions of the Dukes of Saxony. In 1180 the counts of O. and Delmenhorst succeeded in establishing independent states from the territories of Henry the Lion, which fell into a condition of disorganization after his downfall. This family has continued to rule O. to the present day, giving, moreover, new dynasties to the kingdom of Denmark, the empire of Russia, and the kingdom of Sweden: see OLDENBURG, THE HOUSE OF. On the death 1667 of Count Anthony Gunther, wisest and best of the O. rulers, his dominions, in default of nearer heirs, fell to the Danish reigning family, and continued for a century to be ruled by viceroys nominated by the kings of Denmark. This union was severed 1773, when, by a family compact, Christian VII. made over his O. territories to Grand-Duke Paul of Russia, who represented the Holstein-Gottorp branch of the family. Paul having renounced the joint countships of Delmenhorst and O. in favor of his cousin, Frederick Augustus, of the younger or Kiel line, of the House of O., who was Prince-bishop of Lübeck, the emperor raised the united O. territories to the rank of a duchy. The present reigning family is descended from Duke Peter Friedrich Ludwig, cousin to the Prince-bishop Frederick Augustus. For a time the duke was a member of Napoleon's Rhenish Confederation; but French troops having, in spite of this bond of alliance, taken forcible possession of the duchy 1811, and incorporated it with the French empire, the ejected prince joined the ranks of the allies. In recognition of this adhesion the Congress of Vienna transferred certain portions of territory, with 5,000 Hanoverians and 20,000 inhabitants of the quondam French district of the Saar, to the O. allegiance. From these new acquisitions were organized the district Amme and the principality of Birkenfeld, while O. was raised to the dignity of a grand-duchy. The revolutionary movement of 1848 was quite as productive of violent and compulsory political changes in this as in other German states; and in 1849, after having existed for centuries without even a show of constitutional or legislative freedom, it entered suddenly into possession of one of the most extreme of liberal constitutions. The reaction in favor of absolutism, which the license and lack of purpose of the popular party naturally induced all over Germany, led 1852 to revision and modification of the constitution, which, however, in its present form contains the essential principles of popular liberty and security, though more verbal than real. In the German-Italian war, O. sided with Prussia, and afterward joined the N. German Confederation. The duchy concluded 1866 a treaty with Prussia, by which the grand-duke renounced his claims to the Holstein succession, for the cession to him of a small portion of Holstein territory, and an indemnity of 1,000,000 thalers. O. is now included in the German Empire.

OL'DENBURG: city, cap. of the grand-duchy of O.; pleasantly situated on the banks of the navigable river Hunte, 25 m. w.n.w. of Bremen. Pop. (1880) 18,416. O. is the seat of the administrative departments, and the focus of the literary, scientific, and commercial activity of the duchy. It has a normal school, military academy, public library of 85,000 vols., picture, gallery, museum, etc. The grand ducal palace is notable for fine gardens, its valuable pictures and other art collections, and its library. The principal church is St. Lambert's, containing the burying vaults of the reigning family. O. is the seat of an active river-trade, and is noted for its excellent studs and its great annual cattle and horse fairs in June and August.

OLDENBURG, The House of: illustrious as being one of the oldest reigning families of Europe, and rendered still more so by various matrimonial alliances, which, in the course of ages, have successively been the means of creating new royal dynasties. Thus, 1448, a scion of this house being elected king of Denmark, under the title Christian I., became progenitor of the Danish House of Oldenburg, the imperial House of Russia, the late royal family of Sweden, and the collateral and junior Danish lines of Augustenburg, Kiel, and Sonderburg Glücksburg. Christian owed his election to the recommendation of his maternal uncle, Duke Adolph of Slesvig, who, when the throne was offered to him on the sudden death of King Christopher, refused, on the ground of age, and proposed Christian of Oldenburg, who, as the direct descendant of Eric Glipping's daughter, Princess Richissa, was allied to the old extinct House of Denmark. The death, 1459, of Adolph, Duke of Slesvig and Count of Holstein, without male heirs, opened the question of succession to those states, which has since become one of such vexatious import. The ancient law of Denmark recognized hereditary fiefs only in exceptional cases; crown fiefs being generally held for life or merely for a time *ad gratiam*. This being the case, Slesvig might, on the death of Adolph, have been taken by the crown as a lapsed tenure; but Holstein, being held under the empire, would have been separated from it. Adolph and his subjects were alike anxious that Slesvig and Holstein should continue united; but though the Slesvig estates, at the wish of the Duke Adolph, had recognized Christian as successor to the duchy before his accession to the throne of Denmark, the Holstein chambers were divided on the question of succession, the majority showing a preference for the claims of the counts of Schauenburg, who were descended from *male* agnates of the Holstein House. Christian, in his eagerness to secure both states, was willing to sacrifice his rights in Slesvig to his schemes in regard to Holstein; and having bought over the Holstein nobles by bribes and fair promises, he was elected Duke of Slesvig and Count of Holstein at Ribe 1460, where he signed a deed, alike derogatory to the interests and unworthy the dignity of his crown. In this compact, by which he bartered away the just prerogatives and independence of himself and his successors, for the sake of nominal present gain, he pledged his word, for himself and his heirs, that the two provinces should always remain undivided, '*ewig bliben toosamende ungedeelt*,' and not be dismembered by division or heritage. This document, which remained for ages unknown or forgotten, was discovered by the historian Dahlmann amid the neglected papers of the Holstein state archives at Preetz, and proclaimed 1848 by that ardent admirer of Germany as the unchangeable fundamental law of the Slesvig-Holstein provinces. The confusion, dissension, and ill-will to which this fatal deed has given rise, are the fruits which Christian's unscrupulous desire to secure power at any cost has produced for his descendants, whose complicated claims on the duchies resulted, 1864, in a war which cost Denmark a large portion of her territorial possession. From Christian I. descend two distinct branches of the Oldenburg line: 1. The royal dynasty, extinct in the male line in Frederick VII., late king of Denmark, and the collateral branches of Sonderburg Augustenburg, and Sonderburg-Glücksburg; 2. The ducal Holstein-Gottorp line, descended from Duke Adolph (d. 1586), second son of King Frederick I. This prince had received, during his father's lifetime, a portion of the Slesvig and Holstein lands, which he was permitted, on the accession of his elder brother, Christian III., to retain for himself and his heirs. This line became illustrious by the marriage of Prince Karl Friedrich, son of Hedwig-Sofia, eldest sister of Charles XII. of Sweden (a direct descendant of Duke Adolph) with Grand-Duchess Anna, daughter of Peter the Great, and thus gave to Russia the dynasty which still occupies the imperial throne; while Adolph-Friedrich, cousin of Prince Karl Friedrich, by his election to the throne of Sweden, 1751, added another crown to those already held by the House of Oldenburg. The conduct of his descendants rendered the new dignity short-lived, for with the abdication of Gustavus IV., 1809, the Holstein-Gottorp dynasty became extinct in Sweden.

The complicated relations of the House of O. in regard to the Danish succession, after giving rise to much angry discussion among the princes interested, and the Danish people, led the great powers to enter into a treaty, known as the London Treaty of 1852, for settling the question of succession, on the ground that the integrity of the Danish monarchy was intimately connected with the maintenance of the balance of power and the cause of peace in Europe. England, France, Austria, Prussia, Russia, Sweden, and Denmark were parties to this treaty, in the first article of which it was provided that, on the extinction of the male line of the royal house, Prince Christian of Slesvig-Holstein-Sonderburg-Glücksburg and his male heirs, according to the order of primogeniture, should succeed to all the dominions then united under the sway of the king of Denmark. The rights of succession, which rested with the Augustenburg family, were forfeited by a compact which the Duke of Augustenburg entered into for the surrender of his claims, in consideration of a sum of money paid to him by Denmark. The duke's morganatic marriage, and his subsequent rebellion, 1848, against the Danish king, were the causes which led to the arrangement of this family compact on the existing terms. This treaty, the London Protocol of 1852, May, was followed in Oct. by the publication of a supplementary clause, which stipulated that on the extinction of the heirs male of Prince Christian of Slesvig-Holstein-Sonderburg-Glücksburg, the Holstein-Gottorp or imperial Russian line should succeed to the Danish dominions. This article, even more than the original clauses of the treaty, met with the strongest opposition among the Danes, and after being twice rejected in the Landsthing, the London treaty was ratified only after a new election of members, and on the assurance of the king that in excluding all female cognate lines from the succession, there was no definite intention of advancing the claims of Russia. King Frederick's death, 1863, brought on the crisis of the much-vexed question of the Danish succession; and though the London treaty was so far followed that Prince Christian succeeded as king of Denmark, the evils that were anticipated from the measure were in 1864 made painfully manifest; for the Duke of Augustenburg, notwithstanding the renunciation by his family of all claims to the succession, appealed to the federal diet for the recognition of his rights on Holstein; and the German powers, glad of a pretext to extend their influence beyond the Eider, occupied the Slesvig-Holstein (q.v.) territory, and succeeded, by force of numbers, in advancing the boundary of Germany to the borders of Jutland. This led, however, to grave results affecting the whole of Europe. Prussia and Austria took possession of the conquests in their own names. The former power offered the latter pecuniary compensation for their assistance in the war, while indicating a determination to annex the duchies to its own dominions. Austria refused, and this led to the disastrous battle of Königgratz. —See DENMARK: SLESVIG.

OLDHAM, *ōld'ham:* parliamentary borough and flourishing manufacturing town of England, co. of Lancashire, on the Medlock, six m. n.e. of Manchester. It owes its rapid increase in population and in wealth to the extensive coal-mines in the vicinity, and to its cotton manufactures, which have increased remarkably in late years. It is not only the great centre of the hat-manufacture, but is famed also for manufactures of fustians, velveteens, cords, cotton, woolen, and silk goods. Numerous silk-mills, brass and iron foundries, machine-shops, tanneries, rope-works, etc., are in operation. The parish church, the town-hall, the Blue-coat and the Grammar schools, are the chief edifices. Pop. of municipal borough, (1871) 82,629; (1881) 111,343; of parliamentary borough (1871) 113,100; (1881) 152,511.

OLD'HAM, JOHN: about 1590–1636; b. England. He emigrated to Plymouth, Mass., 1623, where it is said he tried to change the form of government. He became involved with Lyford in an intrigue to set up a separate worship. He lived afterward at Hull and Cape Ann, and represented Watertown at the general court 1634. In 1633 he visited the valley of the Connecticut river, and on returning thither with a vessel for the purpose of trading with the Indians was killed by them 1636. His explorations resulted in the settlement of Windsor, Conn., and his death brought on the Pequot war.

OLDHAM, JOHN: 1653, Aug. 9—1683, Dec. 8: English satirist: b. Shipton, Gloucestershire; son of a non-conformist minister. He was educated at Oxford, where he took high rank in Greek, Latin, and poetical composition. His limited means compelled him to leave the univ. 1674, and he was for three years usher in a free school at Croydon. His first published poem was an ode on the death of a friend, full of sympathy and tenderness in strong contrast to the harsh satire of his later writings. He continued to write as a relief from the drudgery of teaching Latin and Greek. Some of his MSS. attracted the attention of the principal wits of London, who visited him at Croydon. He went to London 1681, where he became known by his *Satires on the Jesuits*, which appeared in the height of the excitement regarding the Popish plot. He wrote several other satires. His last poem, *A Sunday Thought in Sickness*, is of a devotional character. His verse was rugged, but marked by warmth of feeling, forcible language, and fertility of incident. He died at Holme, Pierpont.

OLDHAMIA, n. *ōld-hā'mĭ-ă:* genus of peculiar fossil zoöphytes in the lowest Silurian rocks—so called from Prof. *Oldham*, to whom the genus was dedicated by Forbes, its discoverer. Only two species are known, but they are of peculiar interest, because, with their associated worm-tracks and burrows, they are the earliest distinct evidence of life on the globe. They exist as mere tracings on the surface of the laminæ of metamorphosed shales, all remains of the substance of the organism having disappeared. The form of the hard polypidom is preserved, and shows a jointed main stem, giving off at each joint, in one species a circle of simple rays, and in the other a fan-shaped group. Forbes pointed out their affinities in some respects to the *Hydrozoa*, in others to the *Polyzoa*. Kinahan, who described the genus at some length, considers them to have been *Hydrozoa* allied to *Sertularia;* while Huxley places them among the *Polyzoa*.

OLD MAN OF THE MOUNTAIN: see ASSASSINS.

OLDMIXON, *ōld-mĭks'on*, JOHN: 1673–1742, July 9; b. Bridgewater, England. He wrote several unsuccessful plays, and then gave attention to political writing, publishing *The British Empire in America*, 1708 and 41; *Memoirs of North Britain*, and *Memoirs of Ireland*, 1715,6 ; a *Critical History of England, Ecclesiastical and Civil*, 1726; *Clarendon and Whitlock Compared*, 1727; histories of the reigns of Henry VIII., Edward VI., Mary and Elizabeth, also of the Stuarts, William and Mary, Anne, and George I., 1730–39; *Memoirs of the Press, Historical and Political, for Thirty Years*, 1742. These writings are of little merit, by reason of their strong whig partisanship. He was a bitter and unscrupulous critic of Pope and other celebrities in his magazine articles and in his *Prose Essay on Criticism*, to which Pope alludes in the *Dunciad*.

OLD POINT COMFORT: village, Elizabeth City co., Va. It is on the w. side of Chesapeake Bay, at the mouth of the James river, on the Chesapeake and Ohio railroad, near Fortress Monroe (q.v.); three m. from Hampton and 14 m. from Norfolk. A line of steamers gives direct communication with Baltimore. The climate is remarkably uniform and healthful, and the place has long been one of the most popular winter resorts in the country. There are two large hotels, one of which has accommodations for 1,000 people. Pop. (1870) 813; (1880) 808.

OLD RED SANDSTONE: large series of paleozoic rocks, of which red sandstones are the most conspicuous portions, but which contains also white, yellow, or green sandstones, as well as beds of clay and limestone. The group lies below the carboniferous strata, and was called 'old' to distinguish it from a newer series of similar beds above the coal measures. The discovery that the highly fossiliferous calcareous rocks of Devonshire, England, and of the European continent occupied the same geological horizon showed that the name was very far from being descriptive of all the deposits of the period, and suggested to Murchison and Sedgewick the desirableness of giving them a new designation. They consequently proposed Devonian, which has been extensively adopted; but it is liable to the same objection as that urged against the name it was intended to supplant, inasmuch as it incorrectly limits geographically what the other limits lithologically. Many names used by geologists are similarly at fault; there is therefore no good reason why the old name should be given up, especially as it has been rendered classical by the labors and writings of Hugh Miller, the original monographer of these rocks.

The position of the O. R. S. series is easily determined, though the sequence of the various beds which form it is somewhat obscure. All the rocks are between the beds of the Silurian and carboniferous periods. In Wales, Scotland, and Ireland it has been observed that there is an old series of red sandstones more or less conformable with the underlying Silurians; and a newer series unconformable with the older strata, but conformable with the overlying carboniferous rocks. The great interval represented by this break has been believed to be that during which the calcareous Devonian rocks were deposited; but recent researches of Mr. Salter show that the one set of beds do not alternate with the other, but that they are really contemporaneous—the coarse shallow water deposits of conglomerate and sandstone having been formed on the shores of that sea in whose depths the deposits of thicker mass, finer grain, and lighter color, full of marine shells and corals, were at the same time being aggregated.

The strata of the period have been arranged in four groups. 1. Upper Old Red Sandstone, including the Marwood and Petherwin groups. 2. Middle Old Red Sandstone, including the Dartmouth and Plymouth groups. 3. Lower Old Red Sandstone, including the North Foreland and Torbay groups. 4. Tilestones or Ledbury Shales.

1. The Upper Old Red Sandstones are conformable with the inferior strata of the coal measures, and differ so little petrologically, or even paleontologically, from them, that they have been considered as the basement series of that period. They consist of yellowish and light-colored sandstones, which at Dura Den, in Fifeshire, Scotland, are remarkably rich in some of their layers in the remains of ***Holoptychius***, ***Ptericthys***, ***Dendrodus***, etc. In s. Ireland and at Dunse similar beds contain a fresh-water shell

very like the modern *Anodon*, and fragments of a fern called *Cyclopteris Hibernicus*. Salter has shown, from the intercalation of the marine beds with the red sandstone, and from the identity of the fossils, that the Devonian representatives of these beds are the Marwood and Petherwin groups. These consist of dark-colored calcareous and argillaceous beds, and gray and reddish sandstones. The fossils found in them are shells and land-plants, many belonging to the same genera, but of species different from those in the carboniferous system. The little crustacean *Cypridina* and *Clymenia* are so characteristic of this division that in Germany the strata are known as the *Cypridinien Schieffer* and *Clymenien Kalk*.

2. The Middle Old Red Sandstone is represented in n. Scotland by the Caithness flags, a series of dark-gray bituminous schists, slightly micaceous or calcareous, and remarkably tough and durable. Throughout their whole thickness they are charged with fossil fish and obscure vegetable remains. The characteristic fishes belong to the genera *Coccosteus*, *Asterolepis*, and *Dipterus*. The corresponding beds in Devonshire are the Dartmouth and Plymouth groups, extensive deposits of limestones and schists, all abounding in remains of corals, trilobites, and shells. In the German equivalent, the Eifel Limestone, but especially in the Russian, the characteristic invertebrate fossils of the Devonshire calcareous beds have been found associated with the remains of *Coccosteus*, showing beyond doubt the identity of these various beds. The *Calceola Schieffer* of German geologists belongs to the Middle Old Red; it receives its name from the abundance in it of a singular brachiopod (*Calceola sandalina*).

3. The Lower Old Red Sandstone consists of strata of red shale and sandstone, with beds of impure arenaceous limestone (cornstone), and frequently at the base great deposits of red conglomerate. The fossils peculiar to this division are the remarkable fish *Cephalaspis*, and the huge crustacea of the genus *Pterygotus*, besides a few shells. S. of the Grampians the strata consist of a gray pavingstone and coarse roofing-slate. The Devonian representatives of this section are the sandstones and slates of the North Foreland, Linton, and Torbay, and the series of slaty beds and quartz ore sandstones developed on the banks of the Rhine near Coblentz. The *Cephalaspis*, so characteristic of the cornstones, has been found in the Rhenish beds.

4. The Tilestones or Ledbury Shales consist of finely laminated reddish and green micaceous sandstones, which have been noticed underlying the Old Red only on its w. borders in Herefordshire. The fossils of those beds show a Silurian fauna with a number of Old Red forms; the Tilestones are consequently referred sometimes to one period, sometimes to the other.

The O. R. S. occupies a considerable portion of the surface of Great Britain. In the n. it forms the boundary lands of the Moray Firth; beginning even as far n. as the Shetlands and Orkneys, it covers the whole of Caithness, and in more or less broken tracts the e. of Sutherland, Ross, and Cromarty, and the n. of Inverness, Nairn, and Elgin. In the great central valley of Scotland it is the setting in which the coal measures are placed, stretching across the country on the one margin from Forfar to Dumbarton, and occurring on the other in separated tracts in Lanark and Berwick. In the s. division of the island it is limited to a large triangular district in the s.w. The apex of the triangle is at Wenlock, Shropshire; a line thence to Start Point, in Devon, would limit it on the e., and a second line to Milford Haven would limit it on the w. The Bristol Channel bisects it. A depression in the Welsh portion is occupied with S. Wales coal-field; and in a similar depression in Devon are the culm-beds. In Ireland, strata of this age are in the counties of Kilkenny, Waterford, Cork, and Kerry. The Devonian rocks have been carefully studied in Belgium and the Rhine district; also in Russia, where they cover a larger district in the n. of the empire.

The American representatives of this period are extensively developed in N. Y., Penn., and Canada.

The rocks are mostly shales and limestones, total thickness 15,000 ft. (except west, mostly limestones, less than 500 ft.), and as surface rocks extend along the St. Lawrence river, and over most of the n. half of N. Y., and n.w. along the great lakes; also around the 'Cincinnati uplift'—a strip from N. Y. running down the Hudson river and along the Alleghanies to central Ala. The periods, beginning at bottom, are Oriskany Sandstone; Hamilton (embracing Marcellus, Hamilton, and Genesee epochs); Chemung (Portage and Chemung); and Catskill. Escarpments of all, from base to part of Chemung, are seen on the 'finger-lakes' of N. Y., e.g., Cayuga Lake. In this age was the first considerable display of land-plants; of sharks and ganoids; and, except a scorpion in the Upper Silurian, appeared the first known air-breather—an insect, related to May-flies. The period is called the Age of Fishes, referring to the dominant animal life.

The fossils of invertebrate animals found in the O. R. S. do not differ much from those of the Upper Silurian. Corals are remarkably abundant and beautiful in the Devonian limestones. Goniatites and Clymenia make their appearance first in this period, with several forms of lower mollusca. Trilobites are still numerous. But the most striking feature in the period is the abundance of fish of curious forms, strongly protected outside by hard bony cases, or by a dense armor of ganoid scales.

OLD SOUTH CHURCH: historic edifice in Boston Mass. The present structure was erected for the Third Church in Boston (Congl.) 1723, on the same ground where the first structure had stood since 1669. It is a conspicuous object in the business portion of the city, on Washington st., and, though no longer used for sacred purposes, has been constituted a permanent monument of the past. Two portly vols., *History of the Old South Church*, by Hamilton Andrews Hill (1890), have been published, giving a detailed account of the organization of the church and the associated events, and continuing the history to the present day. The following are some incidents in the history of the edifice: In 1707, Benjamin Franklin was baptized there. In 1761, the Rev. Thomas Prince, pastor, at his decease left his classics and a valuable collection of Americana, to be a permanent 'New England Library' in a chamber of the steeple. Seven years later, a 'great clock' was put in the steeple, and nine years afterward did not lose 'two minutes in fourteen weeks.' 1768, June 14, the first of the great popular Revolutionary meetings in the church was held, adjourned thither for lack of room in Faneuil Hall; an English frigate had recently arrived to enforce the new revenue laws. In 1773, a meeting was held that led to the destruction of the cargo of tea. At such gatherings, the walls often echoed to the eloquence of James Otis and Samuel Adams. In 1775, Oct. 27, the church was taken for a cavalry riding school by the British; pulpit and pews were destroyed; the pulpit sounding-board and the two east galleries only were retained, the lower for the selling of liquors; and many of Thomas Prince's books and manuscripts were used for lighting fires. The house, repaired, was opened for worship again 1783. The large glass chandelier, given 1802 by Mrs. John Sweetser at a cost of $800, fell 1887 and was broken in pieces. After the great Boston fire, 1872, the building was for two years used as the city post-office. The last religious service by the old church and society was held there 1872, Nov. 17; the congregation since then has occupied an elegant new church also known as the O. S. C., on the 'Back Bay,' cor. Dartmouth and Royalston streets.

OLD'TOWN: town in Penobscot co., Me.; at the junction of the European and North American and the Bangor and Piscataquis railroads; 70 m. n.e. of Augusta, 12 m. n. of Bangor, on the w. bank of the Penobscot river. It was formerly a part of Orono, but was separated from it 1840; and contains the four villages, Oldtown, Pushaw, Great Works, and Upper Stillwater. It has excellent water-power and manufactories for lumber, carriages, furniture, and barrels. One of its saw-mills is said to be one of the largest in the world. Its chief business is in lumber, about 250,000,000 ft. being rafted annually. It has several churches and a bank. Pop. (1870) 4,529.

OLDYS, *ōl'dĭs* or *ōldz*, William: most erudite and industrious bibliographer: 1696–1761, Apr. 15 natural son of Dr. William Oldys, Chancellor of Lincoln and advocate of the admiralty court. Of his early life, little is known. His father dying 1708, left him a small property, which O. squandered as soon as he got it into his hands. Most of his life was spent as a bookseller's hack-writer. He drank hard; and was so scandalously fond of low company, that he preferred to live within the 'rules' of the Fleet Prison to any more respectable place. As may be supposed from his habits, the dissolute old bookworm was often in extremely necessitous circumstances, and when he died he left hardly enough to bury him decently. It is fair to add that O. had some sterling merits. Captain Grose, who knew him, praises his good nature, honor, and integrity as a historian, and says that 'nothing would ever have biased him to insert any fact in his writings which he did not believe, or to suppress any he did.' For about ten years, O. acted as librarian to Harley, Earl of Oxford, whose valuable collection of books and MSS. he arranged and catalogued. His chief works are *The British Librarian, exhibiting a Compendious Review of all Unpublished and Valuable Books in all Sciences* (London 1737, anonymously); *Life of Sir Walter Raleigh*, prefixed to Raleigh's *History of the World* (1738); Translation of Camden's *Britannia* (2 vols.); *The Harleian Miscellany, or a Collection of Scarce, Curious, and Entertaining Tracts* (8 vols. Lond. 1753). Besides these, O. wrote a great variety of miscellaneous literary and bibliographical 'articles' for his friends the booksellers.

OLEACEÆ, *ō-lē-ā'sē-ē:* natural order of exogenous plants, consisting of trees and shrubs, with opposite leaves, and flowers in racemes or panicles. The calyx is in one piece, divided, persistent; the corolla is hypogynous, generally 4-cleft, sometimes of four petals, sometimes wanting; there are generally two, rarely four stamens; the ovary is free, 2-celled, the cells 2-seeded; the fruit is a drupe, a capsule, or a samara (see these heads); the cotyledons are foliaceous. Nearly 150 species are known, mostly natives of temperate countries: among them are the olive, ash, lilac, privet, phillyrea, fringe tree, etc. Between some of these there is great dissimilarity, so that this order is apt to be regarded as a very heterogeneous group; but the real affinity of the species composing it is seen in the fact that even those most unlike can be grafted one upon another, as the lilac or the olive on the ash. Bitter, astringent, and tonic properties are prevalent in this order.

OLEAGINOUS, a. *ō'lĕ-ăj'ĭ-nŭs* [L. *olĕā'gĭnŭs*, of or pertaining to an olive-tree—from *olĕŭm*, oil: L. *olĕă*, an olive-tree]: oily; unctuous. O'leag'inousness, n. *-nĕs*, oiliness.

OLEANDER, n. *ō'lĕ-ăn'dėr* [F. *oléandre;* It. *oleandro*, the rose-bay-tree—perhaps from mid. L. *arodan'drum*, a corruption of *rhododendron*. *Note.*—Skeat is probably correct in saying that all these forms may be corrupted from a mid. L. word *lorandrum*, of which *rhododendron* is not a rendering, seeing there is no great resemblance between the shrubs: *lorandrum* may rather represent a L. *laurodendron*—from L. *laurus*, a laurel, and Gr. *dendron*, a tree. The text agrees with Brachet and Littré], (*Nerium*): genus of plants of nat. order *Apocynaceæ*, having a 5-parted calyx, set round on the inside at the base with many tooth-like points or glands, a salver-shaped 5-cleft corolla, in the throat of which is a 5-parted and toothed or lacerated corona, five stamens, the anthers adhering to the stigma, the fruit composed of two follicles. The species are evergreen shrubs with leathery leaves, which are opposite or in threes; the flowers in false umbels, terminal or axillary. The COMMON O. (*N. oleander*), native of s. Europe, n. Africa, and many of the warmer temperate parts of Asia, is frequently planted in many countries as an ornamental shrub. It has beautiful red, sometimes white, flowers. The English call it ROSE BAY, and the French ROSE LAUREL (*Laurier Rose*). It attains a height of eight or ten ft. Its flowers give a splendid appearance to many ruins in s. Italy. It delights in moist situations, and is frequent near streams. All parts of it contain a bitter and narcotic-acrid juice, poisonous to men and cattle, which flows out as a white milk when young twigs are broken off. Cases of poisoning have occurred by children eating its flowers, and even by the use of the wood for spits or skewers in roasting meat. Its exhalations are injurious to those who remain long under their influence, particularly to those who sleep under it. A decoction of the leaves or bark is much used in s. France as a wash in cutaneous maladies.—*N. odoratum*, an Indian species, has larger flowers, which are very fragrant.—*N. piscidium* (or *Eschaltum piscidium*), perennial climber, native of the Kasya Hills, has a very fibrous bark, the fibre of which is used in India as hemp. The steeping of the stems in ponds kills fish.

OLEASTER, n. *ō'lē-ăs'tėr* [L. *oleaster*, the oleaster—from L. *ŏlĕă*, the olive-tree: It. *oleastro*, a wild olive-tree]: the wild olive; plants of the ord. *El'æagnăcĕæ:* see ELEAGNUS.

OLE BULL: see BULL, OLE BORNEMANN.

OLECRANON, n. *ō-lĕk'ră-nŏn* [Gr. *ōlenē*, the elbow; *kranos*, a helmet]: in *anat.*, the projecting part of the upper end of the ulna, forming the back of the elbow. OLEC'RANOID, a. *-ră-noyd* [Gr. *eidos*, resemblance]: resembling an elbow.

OLEFIANT, a. *ō-lĕ'fĭ-ănt* [L. *olĕŭm*, oil; *fīō*, I am made]: producing oil: term applied to a gas obtained by heating a mixture of two measures of sulphuric acid and one of alcohol—so called from its forming an oily liquid when mixed with chlorine. OLEFINES, n. plu. *ŏl'ĕ-fĭnz*, the series of chemical bodies homologous with ethene or olefiant gas. OLEFIANT GAS (C_2H_4), ethylene, or heavy carburetted hydrogen, discovered 1796, is transparent and colorless, possesses a disagreeable alliaceous odor, and acts as a poison when breathed. Its specific gravity is 0·981. It takes fire when brought in contact with a flame, and burns

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with bright clear light. When this gas is mixed with oxygen or atmospheric air in the proportion of 1 volume with 3 volumes of oxygen, or with 15 volumes of atmospheric air, it forms a powerfully explosive mixture. It is more soluble in cold than in hot water—100 volumes of water at 32° absorbing 26·5 volumes of the gas, while at 68° they absorb only 14 volumes. It was liquefied by Faraday, under great pressure, but remained unfrozen at —166°. If it be conducted through strongly-heated tubes, or if a continuous series of electric sparks be passed through it, it is decomposed into a very dense black carbon, and double its own volume of hydrogen; and if it is subjected to a less intense heat, the products of decomposition are carbon and light carburetted hydrogen or marsh-gas (CH_4). Chlorine acts upon this gas in a very remarkable manner. When the two gases are mixed in equal volumes, they combine to form a heavy oily liquid, to which the term chloride of olefiant gas, or Dutch Liquid (q.v.), is given. Olefiant gas is a constituent of the gaseous explosive admixtures that accumulate in coal-pits, and of the gaseous products yielded by the distillation of wood, resinous matters, and coal; and the brightness of the flame of ordinary gas depends partly on the quantity of olefiant gas present. This gas is obtained most readily by the action of sulphuric acid on alcohol.

OLEIC, a. *ō'lĕ-ĭk* [L. *olĕŭm*, oil]: oily. OLEIC ACID, the oily acid resulting from the action of linseed and other oils on potash, or during the formation of soap. Oleic acid, at temperatures above 57°, exists as a colorless limpid fluid, of oily consistence, devoid of smell and taste, and (if it has not been exposed to air) exerting no action on vegetable colors. At 40° it solidifies into a firm, white, crystalline mass, and in this state it undergoes no change in the air; but when fluid, it readily absorbs oxygen, becomes yellow and rancid, and exhibits a strong acid reaction with litmus paper. It is not a volatile acid, and on the application of a strong heat, it breaks up into several substances, such as caproic, caprylic, and sebacic acids. If oleic acid be exposed to the action of hyponitric acid, it is converted into an isomeric, solid, fatty acid, termed *elaidic acid.* When distilled with moderately strong nitric acid, it is oxidized into a great number of products, including all the volatile fatty acids, from formic acid to capric acid. When heated with hydrated potash, it breaks up into palmitic and acetic acids. It is very difficult to obtain oleic acid in a state of purity, in consequence of the readiness with which it oxidizes. It is obtained in crude form, as a secondary product, in the manufacture of stearin candles; but almond oil is usually employed when the pure acid is required. Oleic acid forms normal (or neutral) and acid salts; but the only compounds of this class that require notice are the normal salts of the alkalies. These all are soluble, and by the evaporation of their aqueous solution form *soaps.* Oleate of potash forms a soft soap, chief ingredient in Naples soap; while oleate of soda is a hard soap, which enters largely into the composition of Marseille soap. The oleates of the alkalies occur in the animal body, in the blood, chyle, lymph, and bile; they have been found also in pus, in pulmonary tubercles, and in the excrements, after administration of purgatives. **Oleate**, n. *ō'lĕ-āt*, a salt of oleic acid. **Oleiferous**, a. *ō'lĕ-ĭf'ėr-ŭs* [L. *fero*, I produce]: producing oil, as seeds. **Oleine**, n. *ō'lĕ-ĭn*, the pure liquid portion of oil and fat; proved, by the researches of Berthelot, to be a triglyceride of oleic acid: see Glycerine Pure oleine is a colorless and inodorous oil, which solidifies into acicular crystals at about 23° F., is insoluble in water, and only slightly soluble in cold alcohol, but dissolves in ether in all proportions. By exposure to the air, it darkens in color, becomes acid and rancid (from gradual decomposition of the oleic acid), and finally assumes a resinoid appearance. Hyponitric acid converts it into an isomeric, white, solid fat, named *elaidine*—the glyceride of elaidic acid. Pure oleine is obtained by cooling olive oil to 32°, which occasions the separation of the stearin and palmitin in a solid form. The fluid portion is then dissolved in alcohol, which, on being cooled to 32°, deposits in a solid form everything but oleine, which is obtained in a pure state by driving off by heat the alcohol from the decanted or filtered solution. **Oleometer**, n. *ō'lĕ-ŏm'ĕ-tėr*, or **Elæometer** [Gr. *metron*, a measure]: an instr. for testing oils, ascertaining their densities. It consists of a very delicate thermometer-tube, the bulb large in proportion to the stem. It is divided into 50 degrees, and floats at zero in pure oil of poppy-seed, at 38° to 38½° in pure oil of almonds, and at 50° in pure olive oil. **Oleon**, n. *ō'lĕ-ŏn*, a liquid obtained by the distillation of a mixture of oleine and lime. **Oleo-phosphoric**, a. *ō'lĕ-ŏ-fŏs-fŏr'ĭk*, term applied to the peculiar acid found in the brain and nervous matter. Oleo-phosphoric acid is a yellow viscid substance, which is insoluble in water and cold alcohol, but dissolves readily in boiling alcohol and in ether. When boiled a long time with water or with alcohol, or when treated with an acid, it resolves itself into oleine and phosphoric acid; while alkalies decompose it into phosphoric acid; oleates, and glycerine. **O'leo-res'ins**, natural mixture of a resin and an essential oil, forming the vegetable balsams and turpentines. **O'leo-sac'charum**, n. *-săk'kă-rŭm* [L. *oleum*, oil; *sacchărum*, sugar]: a mixture of oil and sugar. **Oleous**, a. *ō'lĕ-ŭs*, or **Oleose**, a. *ō'lĕ-ōs*, oily.

OLEOGRAPH, *ō'lē-ō-grăf:* ordinary chromo-lithograph which has been 'roughed,' as it is termed, on a lithographic stone engraved to imitate canvas. The resemblance to oil paintings which oleographs have when looked at not too closely is produced partly by this roughing process, partly also by their being mounted on canvas, sized, and varnished. The colors used in printing oleographs, since they are meant to imitate oil pictures, are used a little darker than in the case of chromo-lithographs in imitation of water-color drawings.

OLEOMARGARINE.

OLEOMARGARINE, n. *ō'lĕ-ō-mâr'găr-ĭn*, called also BUTTERINE [L. *olĕŭm*, oil, and Eng. *margarine*]: imitation butter made from animal fat. This is animal grease in disguise, and is the result of an ingenious Frenchman's notion that the butter diffused through the milk of the cow is due to absorption of the animal's fat. Taking some minced beef-suet, a few fresh sheep's stomachs cut into small pieces, carbonate of potash, and water, Mège-Mouriez subjected the mixture to a heat of 113° F.; and so, by the action of the pepsine in the sheep's stomachs, separated the fat from the other tissues. By hydraulic pressure this fat was again separated into stearin and margarin; and on putting 10 lbs. of the latter into a churn with four pints of milk, three pints of water, and a little arnotto, and churning the compound, it was easy to turn out a compound sufficiently like butter to pass for that article. The inventor patented his process; and found no difficulty in selling licenses to work it in France, England, Holland, Germany, and the United States. In this country the manufacture of O. developed very rapidly. Of numerous factories working the process, the largest, in New York, began 1876, and was soon converting half-a-million lbs. of fat per week into sham butter, or butter-oil. That quantity of fat would produce 200,000 lbs. of oil or butter. In 1880 it was estimated that this one company exported yearly about 3,000,000 lbs. of O., and that other manufacturers exported from New York alone as much more. Some is sent directly to Great Britain as oil or 'butter;' a large quantity of the oil finds its way to Holland and Germany, is there mixed with a certain proportion of milk, churned, and re-shipped to England as butterine or butter. In the house of commons, 1881, it was declared by the best authorities that the substances so produced were innocuous, and that good butterine was much more wholesome than bad butter. The same claim is made by the manufacturers of O. in the United States. Careful investigation has shown that when properly made from materials in good condition the O. is palatable and wholesome. It contains the same elements as butter, but as the volatile fats appear in smaller proportions, it is claimed that it will keep in good condition for a much longer period. Its opponents assert that the materials used by some of the manufacturers are impure, that the processes adopted are far from cleanly, and that the use of the substance thus produced is injurious to the health. In spite of unfavorable criticism the manufacture of O. assumed large proportions. Not only did the export trade greatly increase, but large quantities were sold in the domestic market. To avoid the very general prejudice against O. it was largely sold as butter. As it could be supplied at low price and yet afford a high percentage of profit, it became a formidable competitor of genuine butter, and caused great depression of the dairy interests of the country. To prevent fraud on the consumers, who were liable to obtain a counterfeit article, and to protect farmers and dairymen, restrictive legislation was resorted to in various states. In N. Y a law 'to regulate the manufacture and sale of oleomargarine' and other imitation dairy products was passed 1882, and its violation was made punishable by fine, or imprisonment, or both, as the court should decide. This was followed, 1884, by a law prohibiting both the manufacture and the sale of O. and other substances imitating butter. The latter enactment was declared unconstitutional by the court of appeals, 1885. State legislation in N. Y. and elsewhere proving unsatisfactory to those in whose interests it was effected, an appeal was made to the national govt. A bill to tax the makers and sellers of O., and to regulate the manufacture and the domestic and export trade therein, was introduced into the house of representatives 1886, Apr. 28. After long debate in both houses and various amendments the bill was passed by both houses in July, and was approved by the pres. Aug. 2. By this law, which is (1890) still in force, each retail dealer is obliged to pay an internal-revenue tax of two cents per lb. on all sales of O., and an annual tax of $48. Each wholesale dealer is taxed $480, and each manufacturer $600 per year The law also requires that O. and other kinds of artificial butter shall be sold only from their original packages, and that each package shall be plainly marked with the name of the article which it contains. The manufacture of O. is still extensive. Sales are made in nearly every state in the Union, but the bulk of the product is exported. In foreign countries it is largely used on the table as a substitute for butter; but in the United States it is used chiefly in cooking. The value of the O. exported (1887) was, imitation butter, $88,848; oil, $4,676,131; (1888) imitation butter, $212,634; oil, $3,230,123. The govt. internal-revenue receipts from the manufacture and sale of O. for the years ending June 30 were, (1887) $723,946.45; (1888) $864,130.76; (1889) $893,823.91.

OLERACEOUS, a. *ŏl′ėr-ā′shŭs* [L. *olĕrācĕŭs*, resembling herbs—from *olus*, any garden-herbs for food]: having the nature and qualities of pot-herbs; used as an esculent pot-herb.

OLÉRON, *o-lā-rōng′*, Isle of (anc. *Uliarus*): island off the w. coast of France, forming part of the dept. of Charente-Inférieure: at one point it is less than a mile from the mainland. It is 19 m. long, about 5 m. broad; 59 sq. m.; and is unusually fertile. The people mostly are Protestants. On O. are the port Le Chateau, and the small towns St. Pierre d'O. and St. George's d'O.—Pop. of isle, 18,200.

OLÉRON, Laws of, or Jugements d'Oléron: famous code of maritime law compiled in France in the reign of St. Louis, and so named from a groundless story that it was enacted by Richard I. of England during the time that his expedition to Palestine lay at anchor at the Isle of Oléron. The real origin of these laws was a written code, *Il Consolato del Mare*, of about the middle of the 13th c., compiled either at Barcelona or at Pisa, forming the established usages of Venice and the other Mediterranean states, and acceded to by the kings of France and counts of Provence. Besides containing regulations simply mercantile, this system defined the mutual rights of belligerent and neutral vessels, as they have been since understood in modern international law. The so-called laws of Oléron were a code of regulations borrowed from the *Consolato*, which for several centuries were adopted as the basis of their maritime law by all the nations of Europe. Copies of the *Jugements d'Oélron* are appended to some ancient editions of the *Coutumier de Normandie:* see NORMANDY, CUSTOMARY LAW OF.

OLFACTORY, a. *ŏl-făk'tėr-ĭ*, or OLFAC'TIVE, a. *-tĭv* [L. *olfactus*, a smelling, the sense of smell—from *olēre*, to smell; *factus*, made]: pertaining to smell; having the sense of smelling; used in smelling, as *olfactory* nerves.

OLGA, *ol'ga*, SAINT: saint of the Russian Church wife of Duke Igor of Kiev, who, having undertaken an expedition against Constantinople, which proved unsuccessful, was slain on his return to his own dominions. His widow O. avenged his death, assumed the govt. in his stead, and for many years governed with much prudence and success. Having resigned the govt. to her son Vratislaf about 952, she repaired to Constantinople, where she was baptized by the patriarch Theophilaktes and received into the church, assuming at baptism the name of Helena, in honor of St. Helena, mother of Constantine. She returned to Russia, and labored with much zeal for the propagation of her new creed; but she failed in her attempt to induce her son, Swäntoslav, to embrace Christianity. Her grandson, Vladimir, having married Chrysoberga, sister of the emperors of Constantinople, Basil and Constantine, was baptized 988; but his grandmother did not live to enjoy this gratification, having died in 978, or, according to other authorities, as early as 970. She is held in high veneration in the Russian Church. Her festival is on July 21, and the practice of venerating her appears to date from the early period of the Russian Church before the schism between the Eastern and Western churches.

OLHÃO, *ōl-yowng':* a town of Portugal, on the seacoast, near Cape de St. Maria, and five miles east from Faro. Pop. 7,025.

OLIBANUM, n. *ō-lĭb'ă-nŭm* [Ar. *ol*, or *al*, the; *luban*, frankincense: Gr. *libanos*, the frankincense-tree]: gum-resin of a bitterish taste, which flows from incisions made in *Boswellia serrata*, a tree found in parts of the East: see BOSWELLIA. It is the *Lebonah* of the Hebrews, *Libanos* or *Libanotos* of the Greeks, *Thus* of the Romans, of all which terms the ordinary English translation is *Frankincense* (q.v.). It occurs in commerce in semi-transparent yellowish tears and masses; has a bitter nauseous taste; is hard, brittle, and capable of being pulverized; and diffuses a strong aromatic odor when burned. It was formerly used in medicine, chiefly to restrain excessive mucous discharges; but that use is now rare. It sometimes enters as an ingredient into stimulating plasters. It is used chiefly for fumigation, and as incense in Rom. Cath. churches. It is sometimes distinctively called *Indian O.;* a similar substance, in smaller tears, called *African O.*, being produced by *Boswellia papyrifera*, a tree growing on bare limestone rocks in e. Abyssinia, and sending its roots to a great depth into the crevices of the rock. The middle layers of the bark are of fine texture, and are used instead of paper for writing.

OLIFANT'S, *ŏl'ĭ-fants*, RIVER: name of two rivers in the Cape Colony.—The *Olifant's River West* rises in the Winterhoek Mountains, and enters the Atlantic lat. 31° 40′, after a course of 150 m., having a basin of drainage of 25,000 sq. m.—The *Olifant's River East* drains a great part of the dist. of George, and joins the Gauritz river 60 m. above the entrance of that river into the sea. Its course is more than 150 m., and it is more available for irrigation than almost any other Cape river.

OLIGÆMIA, n. *ŏl'ĭ-gē'mĭ-ă* [Gr. *oligos*, little; *haima*, blood]: in *med.*, that state of the system in which there is a deficiency of blood.

OLIGANDROUS, a. *ŏl'ĭ-găn'drŭs* [Gr. *olĭgos*, few; *aner* or *andra*, a male]. in *bot.*, having fewer than twenty stamens.

OLIGARCHY, n. *ŏl'ĭ-gâr-kĭ* [F. *oligarchie*—from Gr. *oligarchĭă*, government in the hands of a few—from *olĭgŏs*, few; *archē*, rule, power]: a state in which the government is in the hands of a few; the rule of an aristocracy: in the Greek political writers, that perverted form of an aristocracy in which the rule of the dominant part of the community ceases to be the exponent of the general interests of the state, owing to the cessation of those substantial grounds of pre-eminence in which an aristocracy originated. The governing power in these circumstances becomes a faction, whose efforts are chiefly for their own aggrandizement and the extension of their power and privileges. OLIGARCH, n. *ŏl'ĭ-gârk*, one of a few in power OLIGAR'CHIC, a. *-gâr'kĭk*, or OL'IGAR'CHICAL, a. *-kĭ-kăl*, pertaining to government by a few.

OLIGIST, a. *ŏl'ĭ-jĭst*, or OL'IGIS'TIC, a. *-jĭs'tĭk* [Gr. *oligis'tos*, least—from *olĭgos*, few]: a term applied to specular iron ore—so called because less rich in metal than magnetite OL'IGIST, n. specular iron ore.

OLIGO, *ŏl'ĭ-gō*, or OLIG, *ŏl'ĭg* [Gr. *olĭgos*, few] a prefix in scientific terms, signifying 'few; small in number.'

OLIGOCENE, n. *ŏl-ĭg'ō-sēn* [Gr. *olĭgos*, few; *kainos*, new or recent]: in *geol.*, a term employed to designate certain strata. because supposed to occupy an intermediate position between the Eocene and the Miocene age.

OLIGOCLASE, n *ŏl-ĭg'ō-klāz* [Gr. *olĭgos*, few; *klasis*, a breaking or fracture]: a triclinic soda-lime felspar. so named in allusion to its peculiar fracture.

OLIN, Henry: 1767–1837; b. R. I. He was a farmer in Vt.; with the exception of four years was a member of the legislature 1799–1825, and was a member of the constitutional conventions 1814, 22, and 28. He became associate judge of the court of Addison co. 1801, retained the position five years, was chief judge 1807 and 1810–24, in the latter year was elected to fill a vacancy in congress, and was lieut.gov. 1827–29. He died at Salisbury, Vt.

OLIN, *ō'lĕn*, Stephen, d.d., ll.d.: 1797, Mar. 2—1851, Aug. 16; b. Leicester, Vt.; son of Henry O. He graduated from Middlebury College 1820, was a teacher in S. C. three years, during which period he commenced preaching, connected himself with the Meth. Episc. conference of S. C. 1824, and preached in Charleston with great success for six months, when failing health compelled the relinquishment of his charge. He was prof. of belles-lettres in the Univ. of Ga. 1827–34, was ordained elder 1828, was pres. of Randolph Macon College, Va., 1834–37, resigning in the latter year on account of ill-health. After passing a year in Paris and travelling in various countries of the East, he returned to the United States with health much improved. He become pres. of Wesleyan Univ., Middletown, Conn., 1842, and held the position until his death. He was prominent in the general conference debates on slavery 1844, and was a delegate to the Evangelical Alliance two years later. As an educator he was very successful, and he ranked among the first pulpit orators of his time. He published *Travels in Egypt, Arabia Petræa, and the Holy Land*, 2 vols.; and two baccalaureate sermons. *Greece and the Golden Horn*, and *College Life, its Theory and Practice*, were published after his death; and a number of sermons, lectures, and sketches appeared as *The Works of Stephen Olin*. His *Life and Letters*, edited by his wife, appeared in two vols., 1853. He died at Middletown, Conn.

OLINDA, *ō-lĭn'da* or *ō-lĕn'dâ*: a city of Brazil, in the province of Pernambuco, and 4 m. n. e. from Pernambuco. It was formerly the capital of the province, and there were bloody contests between Spain and Holland for the possession of it. It is still a bishop's seat, Pernambuco being included in the diocese. The whole aspect of the town is that of a place half deserted. Pop. 8,000.

OLIO, n. *ō'lĭ-ō* [Sp. *olla*, a round earthen pot—from L. *olla*, a pot: It. *olla;* F. *oille*, an olio]: a rich Spanish dish composed of different kinds of meat; a mixture; a medley —applied to musical collections.

OLIPHANT, *ŏl'ĭ-fant*, Laurence: 1829–1888, Dec. 23; b. England; son of Sir Anthony O. He studied in England, spent several years in Ceylon, where his father held the office of chief justice, and went to Nepaul with Jung Bahadoor. He studied law at the Univ. of Edinburgh, was admitted to the Scottish and later to the English bar, but after a brief period of practice abandoned law for literature and travel. He attempted an exploration of Lapland, but the govt. officers objecting to its prosecution, he travelled in Russia and obtained materials for a book on ***The Russian Shores of the Black Sea.*** He went to Canada as private sec. of Lord Elgin, the gov.gen.; became supt. of Indian affairs, aided Lord Elgin in securing the trade and fisheries treaty at Washington 1854, and after travelling in the south returned to England. He participated in and wrote a history of some of the expeditions of Omar Pasha, was private sec. of Lord Elgin in China and Japan 1857–59, and published an account of the mission; and was severely wounded while in the diplomatic service in Japan 1861. O was a member of parliament 1865–68; resigned in the latter year and joined The Brotherhood of the New Life, a spiritualistic organization at Portland, N. Y., of which he eventually became the head. He was correspondent of the London ***Times*** during the Franco-Prussian war, was connected with a telegraph cable company 1873–75, and afterward endeavored to colonize the Roumanian Jews in Palestine. In addition to vols. above noted, he published several works; among which are *Piccadilly; Irene McGillicuddy,* a satire on the manners of Americans; *The Land of Gilead;* and *Scientific Religion.* He died at London. O'.s brilliancy, versatility, and accomplishments made him the pet of London society before he deserted that sphere for his dubious social experiment in the United States.

OLIPHANT, MARGARET (WILSON): distinguished English novelist: b. Liverpool, about 1820. The prevalent impression that she is a Scotchwoman is derived from the obvious fondness with which in her earlier works she has treated Scottish character and incident. Her mother, however, was a Scotchwoman of somewhat remarkable type, strongly attached to old traditions. In 1849, Mrs. O. published her first work, ***Passages in the Life of Mrs. Margaret Maitland of Sunnyside,*** which won immediate attention and approval. Its most distinctive charm is the tender humor and insight which regulate its delineation of Scottish life and character. This work was followed by ***Merkland*** (1851); ***Adam Graeme of Mossgray*** (1852); ***Harry Muir*** (1853); ***Magdalen Hepburn*** (1854); ***Lilliesleaf*** (1855); and subsequently by *Zaidee, Katie Stewart,* and *The Quiet Heart,* which appeared first serially in *Blackwood's Magazine.* Though these are of various merit, talent is shown in all. They are rich in the detail dear to the womanly mind; have nice and subtle insights into character, a flavor of quiet humor, and frequent delicacy and pathos in treatment of the gentler emotions. It is, however, on the *Chronicles of Carlingford* that Mrs. O'.s first reputation as novelist was secured. In the first of the two sections separately published, the character of little Netty, the heroine, ranks as an original creation. The other, *Salem Chapel,* perhaps indicates a wider and more vigorous grasp than is found in any other work of this author. Certain of the unlovelier features of English dissent, as exhibited in a small provincial community, are here graphically sketched, and adapted with admirable skill to the purposes of fiction. In 1870, she published *Three Brothers;* 1871, *Squire Arden;* 1872, *Ombra;* 1874, *A Rose in June;* 1876, *Phœbe Junior;*

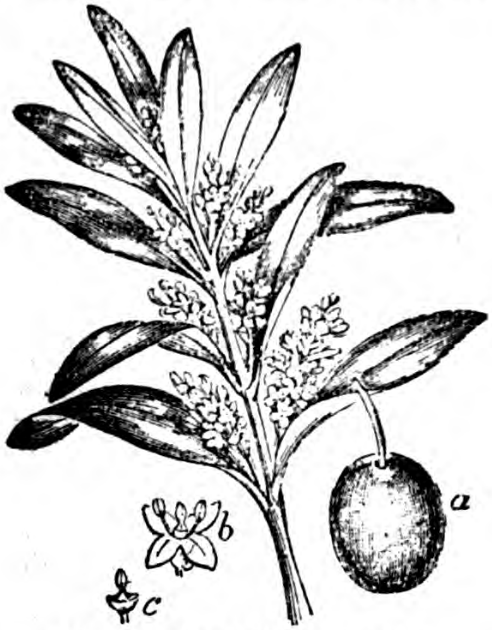
1878, *The Primrose Path;* 1879, *Within the Precincts.* Also: *Life of Edward Irving; St. Francis of Assisi; Memoir of the Comte de Montalembert; The Makers of Florence; The Literary History of England,* from 1790 to 1825 (1882); *A Little Pilgrim: in the Unseen* (on Spiritualism); and *Dante* and *Cervantes* in the series of *Foreign Classics for English Readers,* for which she has also acted as editor.

OLITORY, a. *ŏl'ĭ-tėr-ĭ* [L. *olĭtor*, a kitchen-gardener]: belonging to or produced in a kitchen-garden.

OLIVAREZ, *o-lē-vă'răth*, Don GASPARO DE GUZMAN, Count of, Duke of San Lucar: prime-minister of Philip IV. of Spain: 1587, Jan. 6—1645, July 12; b. Rome, where his father was ambassador. He belonged to a distinguished but impoverished family, received a good education, became the friend of Philip IV., his confidant in his amours, and afterward his prime-minister, in which capacity he exercised almost unlimited power for 22 years. O. showed ability for government, but his constant endeavor was to wring money from the country that he might carry on wars. His oppressive measures caused insurrections in Catalonia and Andalusia, and roused the Portuguese to shake off the Spanish yoke 1640, and make the Duke of Braganza their king, an event which O. reported to Philip with satisfaction, as it enabled him to confiscate the duke's great estates in Spain. But the arms of Spain being unsuccessful, the king was compelled to dismiss the minister, 1643. O. would probably have been recalled to the head of affairs, but for a publication in which he gave offense to many persons of influence. He was ordered to retire to Toro; and there he died. (Cespedes, *Hist. De Felipe IV*)

OLIVE, n. *ŏl'ĭv* [F. *olive*—from L. *olīvă*, the olive-tree: It. *oliva*]: tree of s. Europe and Syria, much valued for its fruit and the oil obtained from it (see below): the emblem of peace: a brownish-green color like the olive-fruit: ADJ. of the color of the olive. OLIVACEOUS, a. *ŏl'ĭ-vā'shŭs*, olive-green. OLIVARY, a. *ŏl'ĭv-ă-rĭ*, resembling an olive. OLIVE-BROWN, a color. OLIVE-CROWN, a reward given at the Olympic games. OLIVE-BRANCH, the emblem of peace. OLIVE-OIL, an oil obtained from the olive-fruit. OLIVE-YARD, a garden or field where olives are cultivated. OL'IVILE, n. *-vĭl*, a starch-like substance obtained from the gum of the olive-tree. OL'IVINE, n. *-vĭn*, an olive-colored, semitransparent mineral consisting of an anhydrous silicate of magnesia with iron, occurring in rounded grains and crystals in many basaltic rocks and lavas (see CHRYSOLITE). OLIVENITE, n. *ŏl-ĭv'ĕn-īt*, an arseniate of copper found in prismatic crystals and other forms, generally of a deep olive-green, sometimes brown or yellow. This mineral consists chiefly of arsenic acid and protoxide of copper, with a little phosphoric acid and a little water, and is found with different ores of copper. It is often crystallized in oblique four-sided prisms, of which the extremities are acutely bevelled, and the obtuse lateral edges sometimes truncated, or in acute double four-sided pyramids: it is sometimes also spherical, kidney-shaped, columnar, or fibrous. OLIVINOID, n. *ŏl-ĭv'ĭn-oyd* [Gr. *eidos*, form, shape]: **a substance occurring in meteorites resembling olivine.**

OL'IVE (*Olea*): genus of trees and shrubs of nat. order *Oleaceæ;* having opposite, evergreen, leathery leaves, which are generally entire, smooth, and minutely scaly; small flowers in compound axillary racemes, or in thyrsi at the end of the twigs; a small 4-toothed calyx, a 4-cleft corolla, two stamens, a 2-cleft stigma; the fruit a drupe. The species are widely distributed in the warmer temperate parts of the globe. The COMMON O. (*O. Europæa*), native of Syria and other Asiatic countries, perhaps also of s. Europe, though probably it is there rather naturalized than indigenous, is in its wild state a thorny shrub or small tree, but through cultivation becomes a tree of 20–40 ft. high, destitute of spines. It attains a prodigious age. The cultivated varieties are very numerous, differing in the breadth of the leaves and in other characters. The leaves resemble those of a willow, are lanceolate, entire, of dull dark-green color above, scaly and whitish-gray beneath; the flowers small and white, in short dense racemes; the fruit greenish, whitish, violet, or even black, never larger than a pigeon's egg, generally oval, sometimes globular, or obovate, or acuminate. The fruit is produced in vast profusion, so that an old olive-tree becomes very valuable to its owner. It is chiefly from the pericarp that olive oil is obtained, not from the seed, contrary to the general rule of the vegetable kingdom. Olive oil is much used as food in the countries in which it is produced, and to a less extent in other countries, to which it is exported also for medicinal and other uses (see OILS). Olives, gathered before they are quite ripe, are pickled in various ways, being usually first steeped in lime-water, by which they are ren-



Common Olive (*Olea Europæa*):
a, fruit reduced; *b*, flower; *c*, flower with corolla and stamens removed to show the pistil.

dered softer and milder in taste. They are well known as a restorative of the palate, and are said to promote digestion. Disagreeable in taste to many persons at first, they are soon greatly relished, and in s. Europe are even a considerable article of food. Dried olives are there used, as well as pickled olives. The wood of the olive-tree takes a beautiful polish, and has black cloudy spots and veins on a greenish-yellow ground; it is principally used for the finest purposes by cabinet-makers and turners. The wood of the root is marked in a peculiarly beautiful manner, and is used for making snuff boxes and small ornamental articles. The bark of the tree is bitter and astringent; and both it and the leaves have febrifuge properties. A gum resin exudes from old stems, which much resembles storax, has an odor like vanilla, and is used in all parts of Italy for perfumery. Among the Greeks, the O. was sacred to Pallas Athene (Minerva), who was honored as the bestower of it; it was also the emblem of chastity. A crown of olive twigs was the highest distinction of a citizen who had merited well of his country, and the highest prize of the victor in the Olympic games. An olive branch was also the symbol of peace (compare Gen. viii. 11); and the vanquished who came to supplicate for peace bore olive-branches in their hands. The O. has been cultivated in Syria, Palestine, and other parts of the East, from the earliest times. Its cultivation extends s. as far as Cairo, and n. to the middle of France. It is propagated generally by suckers, but where great care is bestowed on it, inarching is practiced. It grows from cuttings. The climate of England is too cold for the O., though in Devonshire it ripens its fruit on a south wall. *Oleo similis* and several other species are useful trees of s. Africa, yielding a very hard and extremely durable wood. Some of them bear the name of IRONWOOD at the Cape of Good Hope. The AMERICAN O. (*O. Americana*) also is remarkable for hardness of wood: it is found as far n. as Virginia, a tree of 30–35 ft. high, with much broader leaves than the common olive. Its fruit is fit for use, and its flowers are fragrant. The FRAGRANT O. (*O. fragrans*, or *Osmanthus fragrans*) of China and Japan has extremely fragrant flowers, used by the Chinese for flavoring tea.

OLIVENZA, *ō-lē-vĕn'thâ:* a town of Spain, near the Portuguese frontier; 19 miles south-by-west from Badajoz, on a small river which flows into the Guadiana. The chief branches of industry are the expressing of oil, weaving, and making of earthenware. From the treaty for the cession of O. by Portugal to Spain 1801, Godoy acquired his title Prince of the Peace. Pop. (1877) 7,759.

OLIVER, *ŏl'ĭ-vėr*, **PETER, LL.D.: 1713, Mar. 26—1791, Oct. 13.** After graduating from Harvard College 1730, he entered public life. His home was in Middleborough, Mass., where he had an estate; and he held positions of various grades in Plymouth co. He had not attended a law school, but was appointed a justice of the supreme court 1756, and became chief-justice 1771. He was impeached and suspended from official service 1774 on account of his refusal to accept the salary offered by the colony and to decline any gift or payment from the crown. He made an unsuccessful attempt to hold court while under impeachment, became an avowed and ardent royalist, and on the evacuation of Boston by the British soldiers went to England, where he was pensioned by the govt. He was given to antiquarian pursuits, was an able writer, and collected many papers of value regarding the Plymouth colony. The degree LL.D. was conferred on him by Oxford Univ. His works include a *Scriptural Lexicon* (2d ed. 1832), some political speeches, and a few poems. He died at Birmingham, England.—ANDREW O., 1706-74: brother of Peter O.; b. Boston. He graduated from Harvard College 1724, was a member of the general court 1743-46, in the latter year was appointed councilor, and held the office 19 years; was sec. of the province 1756-70; accepted, but was forced to resign, the office of stamp distributor 1765, and was appointed lieut.gov. 1771. By his support of the home govt. he made himself extremely obnoxious to the colonists. He died at Boston.—ANDREW O.: 1731-99; son of Lieut.Gov. Andrew O.; b. Boston. He graduated from Harvard, was a judge, member of the general court, an able writer, and a pronounced loyalist. He died at Salem.

OL'IVES, MOUNT OF, called also MOUNT OLIVET: inconsiderable ridge on the e. side of Jerusalem, from which it is separated by only the narrow Valley of Jehosaphat. It is called by the modern Arabs Jebel-el Tur, and takes its familiar name from a magnificent grove of olive-trees which anciently stood on its w. flank, but has now in great part disappeared. The road to Mt. Olivet is through St. Stephen's Gate, and leads by a stone bridge over the now almost waterless brook Cedron. Immediately beyond, at the foot of the bridge, lies the Garden of Gethsemane; and the road here parts into two branches, n. toward Galilee, and e. to Jericho. The ridge rises in three peaks, the central one 2,556 ft. above sea level, 416 ft. above the Valley of Jehosaphat. The s. summit is now called 'the Mount of Offense,' and was the scene of the idolatrous worship established by Solomon for his foreign wives and concubines. The n. peak is the supposed scene of the appearance of the angels to the disciples after Christ's resurrection; and is remarkable in Jewish history as the place in which Titus formed his encampment in the expedition against the doomed city of Jerusalem. But it is around the central peak, the Mount of O. properly so called, that all the most sacred associations of Christian history gather. On the summit stands the Church of the Ascension, built originally by St. Helen, the modern church being now in the hands of the Armenian community; and near it are shown, though with no historical authority, the various places where the Lord Jesus, according to tradition, wept over Jerusalem, where the apostles composed the Apostles' Creed, where the Lord taught them the Lord's Prayer, etc. Near the Church of the Ascension is a mosque and the tomb of a Mohammedan saint. In the Garden of Gethsemane, at the foot of the hill, is shown the scene of Christ's agony. The n. peak spreads out into a plain of considerable extent, painfully notable in Jewish history as the place where, after the Jews on occasion of the revolt under Bar-Kochebah were debarred by Adrian from entering Jerusalem, they were wont to assemble annually on the anniversary of the burning of the Temple to celebrate this mournful anniversary, and to take a distant look at their beloved and desecrated Jerusalem. The scene is beautifully described, and with much dramatic feeling, by St. Jerome.—*Com. in Sophoniam*, t. iii. 1665.

OLIVETANS, *ō-lĭv'ĕ-tănz:* religious order of the Rom. Cath. Chh., one of the many remarkable products of the spiritual movement which characterized the 12th and 13th c. The O., or Brethren of Our Lady of Mount Olivet, are an offshoot of the great Benedictine Order (q.v.), and derive their origin from John Tolomei, native of Siena, 1272. Tolomei had been a distinguished prof. of philosophy in the univ. of his native city; but his career was suddenly interrupted by the loss of his sight. Although he was cured of his blindness (and, as he himself believed, miraculously), this visitation convinced him of the vanity of earthly things; and in company with some friends he withdrew to a solitary place near Siena, where he devoted himself to prayer and religious exercises. By the direction of the pope, John XXII., the new brethren adopted the Benedictine rule; but they chose as their especial province the cultivation of sacred science and the duty of teaching. In 1319 Tolomei was chosen the first general; and in his lifetime the institute made rapid progress, especially in Italy. It numbered formerly 80 houses; but the number is now reduced to four—namely, the parent house, so called, of Monte Oliveto, in the diocese of Arezzo in Tuscany, one at Rome, one at Genoa, and one at Palermo. The order has produced many distinguished ecclesiastics.

OLLA, n. *ŏl'la* [Hind.]: a palm-leaf used in the East Indies for writing on with sharpened wood or metal.

OLLA, n. *ŏl'-la*, or OL'LA-PODRI'DA, *-pŏ-drī'dȧ* [Sp. putrid mixture]: Spanish term, originally signifying an accumulation of remains of flesh, vegetables, etc., thrown together into a pot; but usually designating a favorite national dish of the Spaniards, consisting of a mixed stew and hash of different kinds of meat and vegetables. By the poorer classes this dish was sometimes kept so long, to be repeatedly served, as to acquire a bad smell: hence the name. Olla Podrida is figuratively applied to literary productions of very miscellaneous contents (see OLIO). The French equivalent is *pot-pourri*, and the Scotch *hotchpotch*, both of which are used also in a figurative sense.

OLMSTED, *ŏm'stĕd* or *ŭm'stĕd,* DENISON, LL.D.: 1791, June 18—1859, May 13; b. East Hartford, Conn. He graduated from Yale College 1813, was principal of a school in New London two years, tutor at Yale two years, and prof. of chemistry, mineralogy, and geology in the N. C. Univ. 1817-25; and made a geol. survey of the state—the first of its kind. He was prof. of nat. philos. and mathematics at Yale 1825-36; and from 1836 till his death was prof. of nat. philos. and astronomy. He was a close student, made careful observations and investigations, and useful inventions; and was author of text-books on astronomy and nat. philos., which had immense sale. He published many scientific papers in the periodicals of the day. He died at New Haven.

OLM'STED, FREDERICK LAW, A.M.: born Hartford, Conn., 1822, Apr. 26. He studied engineering and scientific agriculture at Yale College 1845-6, worked on a farm to get practical knowledge of the methods of cultivation, and then settled on Staten Island and divided his attention between farming and writing for the press. He travelled in England and on the Continent to observe foreign methods of farming and home adornment, and afterward rode on horseback through the south and southwest, to study the agricultural methods and resources of the region. He was landscape gardener and supt. of the commission for laying out Central Park in New York 1856-61. With Calvert Vaux he drew the plan which in competition with 33 others was pronounced the best, and was followed in the construction of the park. During the civil war he was sec. of the U. S. Sanitary Commission, with headquarters at Washington, and for several years was connected with the N. Y. State Charities Aid Assoc. He was again chief architect of the Central Park 1872-78, and has been one of the principal designers of the Riverside and Morningside parks in New York, the Washington and Jackson parks in Brooklyn, and of public parks and grounds in Boston, Buffalo, Chicago, Montreal, Rochester, and other large cities. He managed the first survey of the Mariposa Grove and the Yosemite Park, was one of the commissioners of the Niagara Falls Reservation, and has been employed to beautify the Capitol grounds at Washington, the grounds of Amherst College and Harvard and Yale Universities, and other educational institutions. He was one of the founders of the American Museum of Nat. History, and of the Metropolitan Museum of Art in New York. The degree A.M. was conferred on him by Harvard and Amherst. Among his works are *Walks and Talks of an American Farmer in England; A Journey through Texas;* and *The Cotton Kingdom*, 2 volumes.

OLMUTZ, *ŏl'mŭts:* second city, and ecclesiastical metropolis, and chief fortress of Moravia, Austria; cap. of the dist. of O.; lat. 49° 36′ n., long. 17° 15′ e.; on an island of the river Morava, which, by means of sluices, can be opened into the moats, and thus made available for defense. O. is the see of an archbishop, nominated by the chapter, and is the chief seat of the administrative departments. Its university, founded 1581, reorganized 1827, was reduced to a theological faculty 1855. O. has a library of 65,000 vols.; good natural history, physical, and other museums; a gymnasium, an archiepiscopal seminary, artillery and infantry academies, polytechnic and other schools, a hospital, an asylum for widows and orphans, etc. The most noteworthy of its churches are the cathedral, a fine old building, and the church of St. Mauritius, completed 1412, with its famous organ, having 48 stops and more than 2,000 pipes. The noble town-hall, with its complicated clock-work, set up 1574, and the lofty column on the Oberring, with several fine fountains in the squares, and the splendid archiepiscopal palace and chapter-house, all contribute to the picturesque aspect for which O. is distinguished. The deficiency in public gardens has of late years been supplied in part by the draining and planting of some of the inner moats, and the conversion of portions of the fortifications into pleasure-grounds. A mile from the city lies the monastery of the Premonstratensians at Hradisch, founded 1074, now a military hospital. O. has a few manufactories of kerseymere, cloth, linen, and porcelain, and is the seat of extensive trade in cattle from Poland and Moldavia. Prior to 1777, when O. was raised into an archbishopric, its bishops had long held the rank of princes of the empire. The city suffered severely during the Thirty Years' War, and again in the Seven Years' War of Silesia, when it more than once fell into the hands of the Prussians. In 1848 Ferdinand I. signed his abdication here in favor of his nephew, Franz-Joseph I.; and 1850, O. was chosen as the place of conference between the Prussian, Austrian, and Russian plenipotentiaries, for adjustment of the differences resulting from the revolutionary movement of 1848. Pop. (1880) 22,849.

OLONETZ, *ŏ'lŏ-nĕts':* government in n. Russia, bounded w. by Finland, e. and n.e. by Archangel; area, exclusive of water, 50,470 sq. m. Pop. (1880) 314,500. Large lakes abound in this govt., the chief, after Lake Onega (q.v.), being Lakes Wygo and Sego: in all more than 2,000 lakes are shown on the maps. The surface is in general elevated, nearly four-fifths of it covered with wood. The soil is sterile, and the climate cold and damp. The wealth consists principally in minerals. Its iron-mines supply the iron-works of Petrasowodsk, and from its quarries marbles are sent to St. Petersburg. The principal employments of the inhabitants, mostly Russians and Finns, and of the Greek Church, are carving in wood, fishing, and hunting. Many are employed also in the ironworks and quarries. The women weave and spin. The government derives its name from the small but ancient town of Olonetz. Petrasowodsk is the centre of administration.

OLORON, or OLORON-SAINTE-MARIE, *o-lo-rōng-săngt-mâ-rē':* chief town in the dept. of Basses-Pyrénées. France; on the Gave d'Oloron. abt. 21 m. s.w. of Pau. It has interesting remains of old fortifications, and pleasant walks with charming views. It has cattle and wool fairs, and manufactures textile fabrics and head-dresses. Pop. 8,000.

OLOT, *o-lŏt':* town of Spain, province of Gerona; 22 m. n.w. from Gerona, near the base of the Pyrenees, on the Fluvia. There are 14 volcanic cones close to the town; the crater of the largest is a mile in circumference and 445 ft. in depth. The whole district is volcanic. In many places, and even in the town itself, currents of air blow continually from the porous lava. These are called *Bufadores* and *Sopladores*, and some of them are conducted beneath houses, and used as refrigeratories in hot weather. They maintain the temperature of about 53° F. both in hot and cold weather, but the gust of air is strongest in hot weather. O. was almost destroyed by an earthquake 1421, but was soon rebuilt. Pop. (1877) 6,867.

OLYMPIA, *ō-lĭm'pĭ-a:* city, cap. of Thurston co. and of Washington; at the s. extremity of Puget Sound, and at terminus of the Olympia and Chehalis Valley railroad. It contains 1 national bank (cap. $75,000), 6 churches, 3 public halls, 6 public-school buildings, 10 hotels, water-works, gas and electric-light plants, street railroad, and U. S. land office. There are 5 saw-mills, 4 shingle-mills, 2 sash and door factories, large water and gas pipe manufactory, and 60 business houses. The vicinity produces grain, hay, fruit, and vegetables; with supplies of deer, bear, geese, duck, salmon, perch, trout, and cod. The city ships spars, piles, lumber, water and gas pipe, hops, wool, and fruit. Pop. (1890) 4,500.

OLYM'PIA: scene of the celebrated Olympic Games (q.v.); a beautiful valley in Elis, in the Peloponnesus, through which runs the river Alpheus. As a national sanctuary of the Greeks, O. contained, within a small space, many of the choicest treasures of Grecian art belonging to all periods and states, such as temples, monuments, altars, theatres, and multitudes of images, statues, and votive-offerings of brass and marble. In the time of the elder Pliny there still stood here about 3,000 statues. The Sacred Grove (called the *Altis*) of Olympia inclosed a level space about 4,000 ft. long by nearly 2,000 broad, containing both the spot appropriated to the games and the sanctuaries connected with them. It was finely wooded, and in its centre stood a clump of sycamores. The Altis was crossed from w. to e. by a road called the 'Pompic Way,' along which all the processions passed. The Alpheus bounded it on the s., and its tributary the Cladeus on the w., and rocky but gently swelling hills on the n.; westward it looked toward the Ionian Sea. The most famous building was the *Olympieium*, or *Olympium*, dedicated to Olympian Zeus. It was designed by the architect Libon of Elis B.C. 6th c., but was not completed for more than a century. It contained a colossal statue of the god, the masterpiece of the sculptor Phidias, and many other splendid figures; its paintings were the work of Panænus, a relative of Phidias. Next to the Olympieium ranked the *Heræum*, dedicated to Hera, wife of Zeus, and queen of heaven, containing the table on which were placed the garlands prepared for the victors in the games (see OLYMPIC GAMES), the *Pelopium*, the *Metroum*, the ten *Thesauri* or Treasuries, built for the reception of the dedicatory offerings of the Greek cities. There were also the temples of Eileithyia and Aphrodite. The *Stadium* and the *Hippodrome*, where the contests took place, stood at the e. end of the Altis. In 1875 explorations were undertaken by the German govt. for six years at an annual expense of about $40,000, and threw much light on the plans of the buildings. Many valuable sculptures, bronzes, coins, and other objects were discovered. The third vol. of *Excavations at Olympia* appeared 1879. The explorations were completed 1881, Mar. 20.

OLYMPIAD, n. *ō-lĭm'pĭ-ăd* [Gr. *olumpĭăs*, or *olum'pĭ-ăda;* L. *olympĭas*, or *olym'pĭădem*]: the period of four years that elapsed between two successive celebrations of the Olympic Games (q.v.); a mode of reckoning which forms the most celebrated chronological era among the Greeks. The first recorded O. dates from B.C. 776, July 21 or 22, and is frequently referred to as the O. of Corœbus; for historians, instead of referring to the O. by its number, designate it frequently by the name of the winner of the foot-race in the Olympic games belonging to that period, though at times both the number and the name of the victor are given. A slight indefiniteness is frequently introduced into Greek chronology, from the custom of mentioning only the O., neglecting to specify in which year of the O. a certain event happened. As this era commenced B.C. 776, the first year of our present era (A.D. 1) corresponded to the last half of the fourth year of the 194th with the first half of the first year of the 195th O., and A.D. 394 corresponds to the second year of the 293d O., at which time reckoning by olympiads terminated. This era is used only by writers, and is never found on coins, and very seldom on inscriptions. Another olympic era, known as the 'New Olympic Era,' was commenced by the Roman emperors, and dates from A.D. 131; it is found both in writings, public documents, and inscriptions. OLYM'PIAN, a. *-pĭ-ăn*, or OLYM'PIC, a. *-pĭk*, pertaining to Olympia or Olympus (q.v.). OLYM'PICS, n. plu. *-pĭks*, the Olympian games or chief public festivals of anc. Greece: see OLYMPIC GAMES.

OLYM'PIAS wife of Philip II., King of Macedon; daughter of Neoptolemus I., King of Epirus, and mother of Alexander the Great: married to Philip II. B.C. 359; d. B.C. 316. She possessed a vigorous understanding, but was most passionate, jealous, and ambitious. Philip having, on account of disagreements, separated from her and married Cleopatra, niece of Attalus (B.C. 337), she went to reside with her brother Alexander, King of Epirus, where she incessantly fomented intrigues against her former husband, and is believed to have taken part in his assassination by Pausanias, B.C. 337. On the accession of her son Alexander to the throne, she returned to Macedonia, where she contributed to the murder of her former husband's second wife Cleopatra, and her daughter. Alexander was filled with indignation, but O. was his mother, and he could not obey the dictates of justice. During his brief but magnificent career he always treated her with reverence, though he never allowed her to meddle with his political schemes. After his death she endeavored to get possession of the vacant throne, and obtained the support of Polysperchon in her designs. B.C. 317, the two defeated Arrhidæus, the weak-minded step-brother and successor of Alexander, and his wife Eurydice, whom O. caused to be put to death the same year. She then began to revenge herself on those Macedonian nobles who had shown themselves hostile to her; but her cruelties soon alienated the people from her, though she was the mother of their heroic king; whereupon Cassander (q.v.), her principal adversary, marched north from the Peloponnesus, besieged her in Pydna, and forced her to surrender in the spring of B.C. 316. She was immediately put to death.

OLYM'PIC GAMES: the most splendid national festival of the ancient Greeks; celebrated every fifth year in honor of Zeus, the father of the gods, on the plain of Olympia (q.v.). Their origin goes back into prehistoric ages. According to the myth elaborated or preserved by the Elean priests, they were instituted by the Idæan Herakles in the time of Kronos, father of Zeus; according to others, by the later Herakles, son of Zeus and Alkmene; while Strabo, rejecting the older and more incredible legends, attributes their origin to the Herakleidæ after their conquest of the Peloponnesus. But the first glimpse of anything approaching historic fact in connection with the games is their so-called revival by Iphitos, King of Elis, with the assistance of the Spartan lawgiver, Lycurgus, about B.C. 884; or, according to others, about B.C. 828, an event commemorated by an inscription on a disk kept in the *Heræum* at Olympia, which Pausanias saw in the 2d c. That festive games were celebrated here, in other words, that Olympia was a sacred spot, long before the time of Iphitos, can hardly be doubted: the universal tradition that the Elean king had only 'revived' the games proves this; but nothing whatever can be historically ascertained concerning their origin, character, or frequency, in this remoter time. Iphitos may, therefore, be regarded as their founder, yet the reckoning of time by Olympiads (q.v.)—the real dawn of the historical period in Greek history—did not begin till more than a century later. At first, it is conjectured, only Peloponnesians resorted to the O. G., but gradually the other Greek states were attracted to them, and the festival became *Pan-Hellenic.* Originally, and for a long time, none were allowed to contend except those of pure Hellenic blood; but after the conquest of Greece by the Romans, the latter sought and obtained this honor, and both Tiberius and Nero figure in the list of Roman victors. Women—with one exception, the priestess of Demeter Chamyne—were forbidden to be present, on pain of being thrown headlong from the Typæan Rock. The games were held from the 11th to the 15th of the Attic month *Hekatombaeon* (our July—Aug.), during which first throughout Elis, then throughout the rest of Greece, heralds proclaimed the cessation of all intestine hostilities; while the territory of Elis itself was declared inviolable. The combatants were required to undergo a preparatory training for ten months in the gymnasium at Elis, and during the last of these months the gymnasium was almost as numerously attended as the games themselves. Much uncertainty prevails as to the manner in which the contests were distributed over the different days. Krause (*Olympia*, p. 106) suggests the following order: On the first day the great initiatory sacrifices were offered, after which the competitors were properly classed and arranged by the judges, and the contests of the trumpeters took place; the second day was set apart for the boys who competed with each other in foot-races, wrestling, boxing, the pentathlon, the pankration, horse-races; the third and principal day was devoted to the contests of men in foot-races of different kinds (e.g., the simple race, once over the course; the *diaulos*, in which the competitors had to run the distance twice; and the *dolichos*, in which they had to run it seven or twelve times); wrestling, boxing, the *pankration* (in which all the powers and skill of the combatants were exhibited), and the race of *hoplites*, or men in heavy armor; on the fourth day came off the *pentathlon* (contest of five games—viz., leaping, running, throwing the discus, throwing the spear, and wrestling), the chariot and horse races, and perhaps the contests of the heralds; the fifth day was set apart for processions, sacrifices, and banquets to the victors (called *Olympionikoi*), who were crowned with a garland of wild olive twigs cut from a sacred tree which grew in the Altis (see OLYMPIA), and presented to the assembled people, each with a palm branch in his hand, while the heralds proclaimed his name, and that of his father and country. On his return home he was received with extraordinary distinction: songs were sung in his praise (14 of Pindar's extant lyrics are devoted to *Olympionikoi*); statues were erected to him, both in the Altis and in his native city; a place of honor was given him at all public spectacles; he was in general exempted from public taxes, and at Athens was boarded at the expense of the state in the Prytaneion.

The regulation of the games belonged to the Eleans, from whom were chosen the *hellanodikai*, or judges, whose number varied. At first there were only two, but as the games became more and more national, consequently more numerous, they were gradually increased to 10, sometimes even to 12. They were instructed in their duties for ten months beforehand at Elis, and held their office only one year. The officers who executed their commands were called *alytai*, and were under the presidency of an alytarch.—See Krause's *Olympia oder Darstellung der grossen olympischen Spiele* (1838) and Bötticher's work (1882).

OLYMPIODORUS, *ō-lĭm-pĭ-ō-dō'rŭs:* one of the latest of the Alexandrian Neo-Platonists; in the first half of the 6th c. after Christ, during the reign of Emperor Justinian. Regarding his life nothing is known. Of his writings, there remains a *Life of Plato*, with commentaries or scholia on several of his dialogues, the Gorgias, Philebus, Phædo, and Alcibiades I. In these O. appears as an acute and vigorous thinker, and as a man of great erudition.—Another O., of the Peripatetic school, lived in Alexandria, B.C. 5th c., and was the teacher of Proclus (q.v.).—A third O., from Thebes in Egypt, wrote a history in the first half of the 5th c. after Christ.

OLYMPIONIC, *ō-lĭm-pĭ-ŏn'ĭk* [Gr. *olumpionikēs*—from *Olumpus*, Olympus; *nikē*, victory]: an ode in honor of a victor in the Olympic games.

OLYMPUS, *ō-lĭm'pŭs:* ancient name of several mountains or chains of mountains—e.g., of the northwestern continuation of Taurus in Mysia, of a mountain in the island of Cyprus, of one in Lycia, of another in Elis, of one on the borders of Laconia and Arcadia, of another on the frontiers of Thessaly and Macedonia. Of these, the last-mentioned (now called *Elymbo*) is the most famous. Its e. side, which fronts the sea, is composed of a line of vast precipices, cleft by ravines, filled with forest trees. Oak, chestnut, beech, plane tree, are scattered abundantly along its base, and higher up appear great forests of pine, as in the days of the old poets of Greece and Rome. With Euripides, it is *poludendros Olympos;* with Virgil, *frondosus Olympus;* and with Horace, *opacus Olympus.* Its highest peak is 9,754 ft. above sea-level, and is covered with snow about nine months of the year. It was regarded by the ancient Greeks as the chief abode of the gods, and the palace of Zeus was supposed to be upon its broad summit of naked rock. According to Greek legend, it was formerly connected with Ossa, but was separated from it by an earthquake, allowing a passage for the Peneius through the narrow vale of Tempe to the sea. The philosophers afterward transferred the abode of the gods to the planetary spheres, to which they likewise transferred the name Olympus.

OM.

OM, *ŏm:* Sanskrit word which, on account of the mystical notions that even at an early date of Hindu civilization were connected with it, acquired much importance in the development of Hindu religion. Its original sense is that of emphatic or solemn, affirmation or assent. Thus, when in the White-Yajur-Veda (see VEDA) the sacrificer invites the gods to rejoice in his sacrifice, the god Savitr'i assents to his summons by saying: '*Om* (i.e., be it so); proceed!' Or, when in the Br'ihad-âranyaka-Upanishad, Prajâpati, father of gods, men, and demons, asks the gods whether they have understood his instruction; he expresses his satisfaction with their affirmative reply, in these words: '*Om*, you have fully comprehended it;' and, in the same Upanishad, Pravâhan'a answers the question of S'wetaketu, as to whether his father has instructed him, by uttering the word '*Om*,' i.e., 'forsooth (I am).' In this, the original sense of the word, it is little doubtful that *om* is but an older and contracted form of the common Sanskrit word *evam*, 'thus,' which, coming from the pronominal base '*a*'—in some derivations changed to '*e*'—may have at one time occurred in the form *avam*, when, by the elision of the vowel following *v*—for which there are numerous analogies in Sanskrit—*avam* would become *aum*, and hence, according to the ordinary phonetic laws of the language, *om*. This etymology of the word, however, seems to have been lost, even at an early period of Sanskrit literature; for another is found in the ancient grammarians, enabling us to account for the mysticism which many religious and theological works of ancient and mediæval India suppose to inhere in it. According to this latter etymology, *om* would come from a radical *av* by means of an affix *man*, when *om* would be a curtailed form of *avman* or *oman;* and as *av* implies the notion of 'protect, preserve, save,' *om* would be a term implying 'protection or salvation;' its mystical properties and its sanctity being inferred from its occurrence in the Vedic writings, and in connection with sacrificial acts, such as are alluded to before.

Hence *Om* became the auspicious word with which the spiritual teacher had to begin, and the pupil had to end each lesson of his reading of the Veda. 'Let this syllable,' the existing Prâtis'âkhya, or grammar of the R'igveda, enjoins, 'be the head of the reading of the Veda, for, alike to the teacher and the pupil, it is the supreme Brahman, the gate of heaven.' And Manu (q.v.) ordains: 'A Brahman, at the beginning and end (of a lesson on the Veda), must always pronounce the syllable *Om;* for unless *Om* precede, his learning will slip away from him; and unless it follow, nothing will be long retained.'

A reason for the mysterious power attributed to this word is given by Manu himself. 'Brahmâ,' he says, 'extracted from the three Vedas the letter *a*, the letter *u*, and the letter *m* (which combined result in *Om*), together with the (mysterious) words *Bhûh'* (earth), *Bhuvah'* (sky), and *Swah'* (heaven);' and in another verse: 'These three great immutable words, preceded by the syllable *Om*, and (the sacred R'igveda verse, called) Gâyatrî, consisting of three lines, must be considered as the mouth (or entrance) of Brahman (the Veda)'—or, as the commentators observe —the means of attaining final emancipation. . . . All rites ordained in the Veda, such as burnt and other sacrifices, pass away; but the syllable *Om* must be considered as imperishable, for it is (a symbol of) Brahman (the supreme Spirit) himself, the Lord of Creation.' In these speculations, Manu agrees with several Upanishads. See VEDA. According to the Mân'd'ûkya-Upanishad, the nature of the soul is summarized in the three letters *a*, *u*, and *m*, in their isolated and combined form—*a* being Vais'wânara, or that form of Brahman which represents the soul in its waking condition; *u*, Taijasa, or that form of Brahman which represents it in its dreaming state; and *m*, Prâjna, or that form of Brahman which represents it in its state of profound sleep (or that state in which it is temporarily united with the supreme Spirit); while *a, u, m* combined, i.e., Om, represent the fourth or highest condition of Brahman, 'which is unaccountable, in which all manifestations have ceased, which is blissful and without duality. *Om*, therefore, is soul; and by this soul, he who knows it enters into (the supreme) soul.' Passages like these may be considered as the key to the more enigmatic expressions used, for instance, by the author of the *Yoga* (q.v.) philosophy, where, in three short sentences, he says: 'His (the supreme Lord's name) is *Pran'ava* (i.e., *Om*); its muttering (should be made) and reflection on its signification; thence comes the knowledge of the transcendental spirit, and the absence of the obstacles' (such as sickness, languor, doubt, etc., which obstruct the mind of an ascetic). Other puerile and absurd explanations were grafted on these three letters, to serve special purposes—each sect, of course, identifying the combination of these letters, or Om, with its supreme deity. Thus, also, in the Bhagavadgîtâ, which is devoted to the worship of Vishn'u in his incarnation as Kr'ishn'a, though it is essentially a poem of philosophical tendencies, based on the doctrine of the Yoga, Kr'ishn'a in one passage says of himself that he is *Om;* while, in another passage, he qualifies the latter as the supreme Spirit.—Although *Om*, in its original sense, as a word of solemn or emphatic assent, is, properly speaking, restricted to the Vedic literature, it is now often used by the natives of India in the sense of 'yes,' without, of course, any allusion to the mystical properties ascribed to it in the religious works. See OM MAN'I PADME HÛM', below.

The etymology as above given seems to set aside completely the supposition of some writers as to a connection between *Om* and *Amen*. Though the derivation of *Om*, as a curtailment of *av-man*, from *av*, 'protect, save,' is probably merely artificial, and, as stated before, invented to explain the later mystical use of the Vedic word, it seems more satisfactory to compare the Latin *omen* with a Sanskrit *avman*, 'protection,' as derived by the grammarians from *ăv* (in the Latin *ăve-o*), than to explain it in the fashion of the Roman etymologists: 'Omen, quod **ex** ore **primum** elatum **est, osmen dictum;'** or, 'Omen velut oremen, quod fit ore augurium, quod non avibus aliove modo fit.' And since *pra-nava*, from Sanskrit *nu*, 'praise,' is, like *Om*, used in the sense of 'the deity,' it is likewise probable that *numen* does not come, as is generally believed, from Latin *nu-(ere)*, 'nod,' but from a radical corresponding with the Sanskrit *nu*, 'praise.'

OM MAN'I PADME HÛM': the 'formula of six syllables' which has acquired celebrity from its conspicuous place in the religion of the Buddhists, and especially in that form of it called *Lamaism* (q.v.). It is the first subject which the Tibetans and Mongols teach their children, and it is the last prayer muttered by the dying man; the traveller repeats this formula on his journey, the shepherd when attending his flock, the housewife when performing her domestic duties, the monk when absorbed in religious meditation, etc. It is seen everywhere; on flags, rocks, trees, walls, columns, stone-monuments, domestic implements, skulls, skeletons, etc. It is deemed the essence of all religion and wisdom, and the means of attaining eternal bliss. 'These six syllables,' it is said, 'concentrate in themselves the favor of all the Buddhas, and they are the root of the whole doctrine . . . . ; they lead the believer to re-birth as a higher being, and are the door which bars from him inferior births; they are the torch which illuminates darkness, the conqueror of the five evils;' etc. They are likewise the *symbol* of transmigration; each syllable successively corresponding with, and releasing from, one of the-six worlds in which men are reborn; or they are the mystical designation of the six transcendental virtues, each successive syllable implying self-offering (*dâna*), endurance (*kshânti*), chastity (*s'îla*), contemplation (*dhyâna*), mental energy (*vîrya*), and religious wisdom (*prajná*). The reputed author of this formula is the Dhyâni-Bodhisattwa, or deified saint, *Avalokites'wara*, or, as the Tibetans call him, *Padmapân'i* (i.e., the lotus-handed). It would not belong, accordingly, to the earliest stage of Buddhism, nor is it found in the oldest Buddhistic works of n. India or of Ceylon. Its original sense is obscure; one perhaps probable interpretation is: 'Salvation (*om*) [is] in the jewel-lotus (*man'i-padme*), amen (*hûm'*);' when the compound word 'jewel-lotus' would mean the saint Avalokites'wara and the flower whence he arose. If this interpretation be correct, the formula was originally nothing more than a salutation addressed to a saint; and the mystical interpretation put on each syllable of it was analogous to that which imparted a transcendental sense to each of the letters of the syllable Om. Dr. Emil Schlagintweit, in *Buddhism in Tibet* (Leipzig 1863), relates (p. 120) that 'in a prayer-cylinder which he had the opportunity of opening, he found the formula printed in six lines, and repeated innumerable times upon a leaf 49 ft. long and 4 inches broad. When Baron Schilling de Canstadt paid a visit to the temple Subulin, in Siberia, the Lamas were just occupied with preparing 100,000,000 of copies of this prayer to be put into a prayer-cylinder; his offer to have the necessary number executed at St. Petersburg was readily accepted, and he was presented, in return for the 150,000,000 of copies that he forwarded to them, with an edition of the Kanjur, the sheets of which amount to about 40,000. When adorning the head of religious books, or when engraved upon the slabs resting on the prayer-walls, the letters of the formula are often so combined as to form an anagram: the power of this sacred sentence is supposed to be increased by its being written in this form. These anagrams are always bordered by a pointed frame indicating the leaf of a fig-tree.'—See also E. Burnouf, *Introduction à l'Histoire du Buddhisme Indien* (Paris 1844); C. F. Koeppen, *Die Religion des Buddha* (Berlin 1857–59); and the works quoted by these authors.

-OMA: termination of many medical terms, signifying a morbid condition, as in sarcoma, fibroma.

OMAGH, *ō'mâ*, locally *ō-mâch'* (Irish, *Oigh magh*, 'seat of the chiefs'): ancient town, cap. of county Tyrone, Ireland; on the river Strule, 34 m. s. from Londonderry, 110 m. n.n.w. from Dublin, with both which cities it is connected by railway. O. grew up around an abbey founded 792, but is heard of first as a fortress of Art O'Nial in the end of the 15th c., about which time it was forced to surrender to the English, though its possession long continued to alternate between Irish and English hands. It formed part of James I.'s 'Plantation' grants, and was strongly garrisoned by Mountjoy. On its evacuation by the troops of James II., 1689, it was partially burned; and a second fire, 1743, completed its destruction. But it has been well rebuilt, and is now a neat and prosperous town. Pop. (1881) 4,126. O. contains a very handsome court-house, where the assizes for county Tyrone are held; and several neat churches (Rom. Cath., Episc., and Presb.). Its trade is chiefly in brown linens, corn, and agricultural produce.

OMAGRA, n. *ŏm'a-gra* [Gr. *ōmos*, the shoulder; *agra*, a seizure]: in *pathol.*, gout in the shoulder; pain in the shoulder.

OMAHA, *ō'ma-haw:* city, cap. of Douglas co., Neb.; on the w. bank of the Missouri river, opposite Council Bluffs; on the Chicago and Northwestern, the Chicago Rock Island and Pacific, the Chicago Burlington and Quincy, the Sioux City and Pacific, the Kansas City and St. Joseph, the Union Pacific, the Omaha and Northwestern, the Omaha and Southwestern, the Omaha and Republican Valley, and 4 minor railroads; 18 m. above the junction of the Platte and Missouri rivers, 50 m. n.e. of Lincoln, 470 m. n. by w. of St. Louis, 496 m. w. by s. of Chicago; area 25 sq. m. It is beautifully located on a plateau rising gradually into bluffs, 80 ft. above the river, 950 ft. above sea-level; is divided into two parts: the level, used chiefly for business purposes, and the bluffs, covered with elegant, costly residences, charmingly adorned; and is in all respects one of the most remarkable and progressive cities in the United States. The first settlement in the vicinity was on the opposite side of the river, where there was a thrifty Mormon town 1846, known at various times as Miller's Hill, Miller's Hollow, Kanesville, and, more recently, Council Bluffs. A primitive ferry connected the town with the Otoe and Omaha Indian reservations in Neb., and the former became an important outfitting station for the overland travellers to Cal. In 1853 the old ferry was superseded by the Council Bluffs and Nebraska steam-ferry; and in the following year the Indians sold their land, Neb. with Kan. were thrown open to settlers, and the present city of O. was laid out.

Its rapid development dates from the completion of the Union Pacific railroad, and it is now (1890) the centre of 13 converging railroads that run 122 passenger trains in and out of it daily. In 1888 it was the third largest pork-and-beef packing centre in the country, and had doubled its pop., wholesale trade, grocery trade, and bank deposits in four years; its lumber, hat and cap, and boot and shoe business in three years; its brick, hardware, and dry-goods trade in two years; and its live-stock business in one year. A railroad bridge connecting O. and Council Bluffs was completed 1873; and 1885 a larger one of steel, with two tracks, a wagon-road, and a foot-path on each side, was begun by the Union Pacific railroad company, and completed 1887, at a cost of about $2,000,000. In 1887 the wholesale traffic of O. aggregated $44,216,000; the bank clearings $147,414,448; and the bank deposits $11,743,681. The manufacture of bricks employed 2,051 men, who received $47,000 in wages monthly, and produced 86,500,000 bricks during the year. The grain elevators handled 4,048,206 bushels of corn, 649,736 of wheat, 748,061 of oats, 188,155 of barley, and 11,883 of rye. More than $2,000,000 capital had been invested in the construction of stock-yards covering 25 acres; the receipts were 235,723 cattle, 1,011,703 hogs, 70,014 sheep, and 3,098 horses; and the total cost of slaughtered animals was $13,708,124. There were 27 m. of street railroad (horse), with 65 cars and 500 horses, besides 7 m. of cable tramway; 86 m. of water mains; 934 telephones, with 742 m. of wire; and 2,233,962 local telegraph messages sent and received, and 2,120,061 relayed. There were 100 manufacturing establishments, employing 6,000 hands, and paying $450,000 in wages monthly. The most important were the construction and repair shops of the Union Pacific railroad, 1,500 men; the Grant smelting works, largest in the world, 500 men; brick-yards, 1,500 men; and foundries, white lead, iron, linseed-oil, carriage, and nail works. Owing to the proximity of the great coal-fields of Ia. and the competition of railroad companies, coal for manufacturing purposes can be delivered in O., in car-lots, at $1.50 per ton. 1890, Jan. 1, reports showed 103 m. of graded streets, crossing each other usually at right angles, of which 52 m. were paved, cost $5,614,954; 120 m. of water mains and 1,113 fire hydrants; 40 m. of gas mains and 820 lamps; $848,665 expended on public improvements during previous year, besides $2,010,666 expended by the franchised corporations; and 1,918 new buildings of all grades, erected at a cost of $7,064,556, including 22 churches and school-houses, costing $10,000 to $100,000 each, besides $750,000 expended in completing business blocks begun a year previous—making the total of new buildings for the year 2,082, and the cost $8,609,662. The clearing-house showed transactions aggregating $208,681,000; manufactures $23,515,000; pork-packers (s. Omaha) $13,000,000; and the wholesale dealers $44,910,000, exclusive of products manufactured in the city. There were 9 national banks (cap. $3,400,000), 9 state banks (cap. $1,609,000), and 1 incorporated bank.

The churches numbered 67 and were divided denominationally as follows: Meth. Episc. 12; Presb. 10; Congl. 9; Bapt. 7; Rom. Cath. 7; Lutheran 7; Prot. Episc. 5; Evangelical 3; Christian 2; Jewish 2; Spiritualist 1; Unit. 1; and Latter-day Saints 1—total membership about 30,000, with the Meth. Episc. and Rom. Cath. churches leading. O. is the seat of a Rom. Cath. and a Prot. Episc. bp., and is the residence of a bp. of the Meth. Episc. Church. All the secret and benevolent orders were represented by a membership of about 10,000, and the Masons, Odd Fellows, and Knights of Pythias had large and costly halls. Many of the private business structures are magnificent; and among notable public buildings are the co. court-house, cost $300,000; U. S. court-house and post-office; high school, accommodating 800 pupils, on the site of the first state capitol, cost $250,000; Union Pacific railroad depot; Grand Central Hotel; public library (more than 25,000 vols.); city hall, cost $400,000; Grand Opera-house; Boyd's Opera-house; Creighton College; the U. S. army headquarters, milit. dept. of the Platte; State Institution for the Deaf and Dumb; and State Home for the Friendless. The U. S. govt. building, built 1873 at cost of $269,000, is a substantial stone structure, but of inadequate dimensions; and the govt. has purchased a new site for $400,000, on which is to be erected a new building to cost $1,500,000. The educational report 1887-8 showed 16,497 children of school age (5-21 years), of whom 10,661 were enrolled in the public schools, and 7,134 in average daily attendance; 44 public-school buildings; school property of all kinds valued at $1,253,000; total amount of funds available for the school year $683,733; and total expenditure $473,750. There were two denominational academies for girls: the Acad. of the Sacred Heart (Rom. Cath.), opened 1881, which had 18 instructors and 110 students, and Brownell Hall (Prot. Episc.), opened 1863, which had 12 instructors, 130 students, and grounds and buildings valued at $200,000. Creighton College (Rom. Cath.), founded 1879 in honor of Edward Creighton, had 10 professors and instructors, 191 students, 4-years' course, 3,500 vols. in the library, scientific apparatus valued at $15,000, grounds and buildings valued at $200,000, permanent productive funds $165,000, income, excepting board and lodging, $12,000, benefaction $10,000, pres. Rev. M. P. Dowling, S.J. The O. Medical College, opened 1881, had 16 professors and instructors, 30 students, 3-years' course, pres. Jacob C. Denise, M.D. The public-school system is maintained by an annual license-fee of $1,000 on each saloon (248 in 1888) and police-court fines, with a tax levy of one mill. Net public debt (1890, Jan. 1) $1,661,100; aggregate value of real and personal property $20,726,689; tax rate $4.80 per $100.—Pop. (1860) 1,183; (1870) 16,083; (1880) 30,518; (1885) 61,000; (1890, Jan. 1) 135,000.

OMAHAS, *ō'ma-hawz:* tribe of N. American Indians belonging to the Dakota family. Marquette alludes to them on his map, 1673, and Carver visited them on St. Peter's river, Minn., about 1766. They consisted of two tribes, the Ishtasunda or Gray Eyes and the Hongashano. They lived an agricultural life. About 1800 they made a permanent peace with the Poncas and Pawnees. 1802 they were reduced by small-pox to 300 people, having previously been a prosperous tribe with 700 warriors; disheartened by their loss, they burned their villages and entered on a wandering life, going westward as far as the Niobrara river, Neb. Their enemies, the Sioux, pursued them relentlessly then as now. In 1815, 20, 25, and 30, by a succession of treaties, they ceded lands at Council Bluffs and elsewhere, receiving by the last treaty an annuity, a blacksmith, and agricultural implements. Missions have been established among them. 1854, Mar. 16, more lands were ceded. Since their great chief, Logan Fontanelle, was killed by the Sioux, 1855, they have given their attention entirely to agriculture, and have rapidly improved their condition. In 1873 they had a good church and three schools. They were about 1,000 in number, with property estimated at $75,000: their reservation contained 345,000 acres in n.e. Neb., between the Missouri and Elkhorn rivers.

OMAN, *ō-mân':* most eastern portion of Arabia, a strip of maritime territory between Ras-el-Jiboul and Ras-el-Had, bounded n.e. by the Gulf of Oman, and s.w. by the deserts of the interior; about 370 m. long, greatest breadth 120 m. A chain of mountains running parallel to the coast 20 to 40 m. distant, reaches in its highest ridge, *Gebel Achdar* ('Great Mountain'), an elevation of 6,000 ft.; the average height is 4,000 ft. There are a few streams and some richly fertile tracts in this region, but the greater part is a waste of sand, with here and there a small oasis, where, however, the vegetation is most luxuriant. Groves of almond, fig, and walnut trees tower to an enormous height, overshadowing the orange and citron trees, but are themselves overtopped by the splendid date-palms. The most powerful state of O. is *Muscat* (q.v.).

OMAR, *ō'mėr*, ABÛ-HAFSA-IBN-AL-KHETTAB: second Caliph of the Moslems: 581–644 (reigned 635–644). His early history is little known, but previous to his conversion he was an ardent persecutor of Mohammed and his followers. After his conversion he became as zealous an apostle as he had formerly been a persecutor, and rendered valuable aid to the prophet in all his warlike expeditions. After Mohammed's death, he caused Abu-bekr (q.v.) to be proclaimed caliph, and was himself appointed *haujeb*, or prime-minister. Though of fiery and enthusiastic temperament, he was a sagacious adviser, and it was at his suggestion that the caliph put down with an iron hand the many dissensions which had arisen among the Arabs after the prophet's decease, and resolved to strengthen and consolidate their new-born national spirit, as well as propagate the doctrines of Islam, by engaging them in continual aggressive wars. On the death of Abu-bekr, O. succeeded as caliph, and pushed on the wars of conquest with increased vigor. He was summoned to Jerusalem 637, to receive the keys of that city, and before leaving gave orders to build a mosque, now called by his name, on the site of the temple of Solomon. O. then took command of a portion of the army, and reduced the other chief cities of Palestine. He then planned an invasion of Persia, which was commenced the same year, and by 642 the whole of what is now known as Persia was subdued. In the mean time the war in Syria was vigorously prosecuted, and the Byzantine armies, repeatedly defeated, at length gave up the contest. In 639, Amrû, one of his generals, had invaded Egypt with a considerable force; but such was the prestige of the Arabs, or the incapacity of the lieutenants of Emperor Heraclius, that this valuable country, with its six millions of people, was reduced under the caliph's authority without a single contest, and at only two towns, Misr and Alexandria, was there even an attempt at defense. (For the story which was till lately believed concerning the destruction of the Alexandrian Library, see ALEXANDRIAN LIBRARY.) Barca and Tripoli were next subdued by Amrû. On the n., Armenia was overrun 641, and the caliph's authority reached from the Desert of Khiva to the Syrtis, an enormous extension in ten years. In 644, O. was assassinated in the mosque of Medina by a Persian slave for revenge. He languished five days after receiving the wound, but refused to appoint a successor, and named six commissioners who were to choose one from themselves. He was buried in the mosque of Medina, near the prophet and Abu-bekr, and his tomb is still visited by pilgrims.

O. may be called the founder of the Mohammedan power, as from a mere sect he raised it to the rank of a conquering nation, and left to his sucessor an empire which Alexander the Great might have envied. In him we find a rare combination of qualities, the ardent zeal of the apostle side by side with the cautious foresight and calm resolution of the monarch. His great military talents and severity to 'obstinate unbelievers' rendered him formidable to his enemies, and his inexorable justice rendered him no less obnoxious to the more powerful of his subjects, and gave rise to many attempts at his assassination. O. was the founder of many excellent institutions; he assigned a regular pay to his soldiers, established a night-police in towns, and made excellent regulations for more lenient treatment of slaves. He also originated the practice of dating from the era of the *Hedjrah* (see HEGIRA). He assumed the title *Emir-al-mumenin* ('Commander of the Faithful') in preference to that of *Khalifah-rasouli-Ilahi*, the ordinary designation; and to the present day his name is held in the greatest veneration by the orthodox or Sunî sect of Moslems.

OMAR PASHA, *ō'mėr pâ'shâ* (real name MIKAIL LATTUS): Turkish general: 1806 (or 11)–1871; b. Plaski, an Austrian village in the Croatian Military Frontier. His father was an officer in the Austrian army, and Mikail was educated at the milit. school of Thurn, near Carlstadt, where he greatly distinguished himself. He afterward joined one of the frontier regts. as a cadet, and was employed as sec. by the milit. inspector of roads and bridges; but having by some breach of discipline rendered himself amenable to punishment, he fled to Bosnia, where he became bookkeeper to a Turkish merchant and embraced Mohammedanism. He was next employed by Hussein Pasha, gov. of Widin, as tutor to his sons; and 1834 was sent in charge of them to Constantinople, where his beautiful caligraphy gained him the post of writing-master in the milit. school. Omar Effendi (as he was then called) was next appointed writing-master to Abdul-Medjid, heir to the throne, and received the honorary rank of capt. in the Turkish army, and the hand of a rich heiress. On his pupil's accession 1839, O. was raised to the rank of col. and sent to Syria to aid in the suppression of disturbances in that province, and in 1842 was appointed milit. gov. of the Lebanon district. The severity of his rule did not hinder the Maronites from desiring to have him as chief of the Mountain; but in the following year he was recalled, received the title pasha, and was sent, with Redschid Pasha, against the revolted Albanians. The skill and energy with which he suppressed this insurrection, as well as others in Bosnia and Kurdistan, raised him high in favor with the sultan. Toward the end of 1852 he opened the campaign against the Montenegrins, who were being rapidly subdued, when Austria interfered and compelled a treaty. On the invasion of the Principalities by the Russians 1853, July, O. collected at Schumla an army of 60,000 men to cover Constantinople; but being no less a politician than a soldier, he soon divined that the Russians would not immediately cross the Danube, and accordingly pushed on to Widin, where he crossed the river in presence of the enemy and intrenched himself at Kalafat. Another part of the Turkish army moved down the Danube to Turtukai, near Silistria, crossed the river at that place, and intrenched themselves at Oltenitza. Nov 4, the latter division were attacked by 9,000 Russians, whom they totally defeated with a loss of nearly 4,000 men and almost all their officers. The Russians received two severe checks also at Kalafat 1855, Jan. 6 and Mar. 15. O. kept up the spirit of his troops by occasional successful skirmishes with the Russians, and threw a garrison of 8,000 men into Silistria. In the following spring the Russians passed the Danube at two points, and laid siege to Silistria (q.v.), but their assaults were invariably repulsed with severe loss. The Russians then withdrew from the Principalities, and O. entered Bucharest in triumph 1854, Aug. 1855, Feb. 9, he embarked for Eupatoria, where, on the 17th, he was suddenly attacked by 40,000 Russians, who were repulsed with great loss.

He was soon afterward (1855, Oct. 3) sent to relieve Kars, but arrived too late, and the armistice which followed (1856, Feb. 29) put a stop to his military career. He was subsequently made gov. of Bagdad; but having been accused of maladministration, was banished to Kaarport 1859. He was recalled in the following year, and 1861, Sep. was sent to pacify Bosnia and Herzegovina, which were again in insurrection. This being accomplished, he attacked the Montenegrins, captured their chief town of Cetinji, and overran the country 1862. O. held the grand cross of the Legion of Honor, and was a knight of the Russian Order of St. Anne. He ceased to take part in public life in 1869, being thereafter regarded as a minister without portfolio.

OMASUM, n. *ō-mā'sŭm* [L. *omāsum*, bullock's tripe]: in *anat.*, the third stomach, or manyplies, of ruminant animals.

OMBAY, *ōm-bī'*, or MALOEWA (Maluwa): island between Calebes and the n.w. coast of Australia; n. of Timor, from which it is separated by the Strait of Ombay; lat. 8° 8'–8° 28' s., long. 124° 17'–125° 7' e.; 961 sq. m. The hills of O. are volcanic, and the coasts steep and difficult to approach. The inhabitants are dark brown, have thick lips, flat nose, and woolly hair; appearing of mixed Negro and Malay origin. They are armed with the bow, spear, and creese, and live on the produce of the chase, with fish, cocoa-nuts, rice, and honey. A portion of the island belonged formerly to the Portuguese, but since 1851, Aug. 6, it has been entirely a Netherlands possession. The Dutch postholder resides at the village of Alor, to which iron wares, cotton goods, etc., are brought from Timor, and exchanged for wax, edible nests, provisions, and other native products. O. has oxen, swine, goats, etc., and produces maize, cotton, and pepper. Amber also is found, and the Boeginese of Celebes import European and Indian fabrics, exchanging them for the produce of the island, which they carry to Singapore. Pop. about 193,800.

OMBRE, n. *ōm'bėr* [F. and It. *ombre*, a game at cards—from L. *homo*, a man: Sp. *hombre*, a man]: a game at cards, usually played by three persons.

OMBROMETER, n. *ŏm-brŏm'ĕ-tėr* [Gr. *ombros*, rain; *metron*, a measure]: a rain-gauge.

O'MEARA, *o-mā'ra*, BARRY EDWARD: 1786–1836; b. Ireland: remembered from his connection with Napoleon I., whom he accompanied to St. Helena as household physician. At the age of 18 he entered the British army as asst.-surgeon. In 1808, stationed at Messina, he became concerned in a duel as second, and was dismissed from the service by sentence of court-martial. He succeeded in procuring an appointment as surgeon in the navy, and after some years of efficient service, he was serving with Capt. Maitland in the *Bellerophon* when Emperor Napoleon (q.v.) surrendered himself to that officer. Napoleon proposed that O'M. should accompany him into exile as private physician; and O'M. acceded, stipulating that he should retain his rank in the navy, and be permitted to return to it at pleasure. In daily intercourse with the fallen emperor at St. Helena for about three years, O'M. seems to have been admitted to some intimacy. O'M. took notes of his conversations with Napoleon, which he afterward published. Meantime he became involved in the interest of Napoleon, in the series of miserable and petty squabbles which he waged with the gov., Sir Hudson Lowe (q.v.). The result of these, as regards O'M., was that 1818, after a violent altercation with Sir Hudson, he was committed to close arrest, and was authorized by the emperor to resign his post. On his return to England, he addressed a letter to the admiralty, in which, among other things, he accused Sir Hudson Lowe of intentions against the life of his captive, and even of having, by dark hints to himself, insinuated a desire for his services as secret assassin. For this he was instantly dismissed the service. The accusation was plainly monstrous and incredible. In 1822, after Napoleon's death, O'M. published *Napoleon in Exile*. As conveying to the world the first authentic details of the prison-life of the great soldier, it caused immense sensation, and—though for obvious reasons to be accepted only with great caution—it has still some value, and considerable interest. The last years of O'M.'s life were passed in obscurity in the neighborhood of London, where he died.

OMEGA, n. *ō-mē'gă* [Gr. the *ō* long]: the last letter of the Greek alphabet; the last; the end; in Gr. the short *ŏ* is called *omĭcrŏn*.

OMELET, or **OMELETTE**, n. *ŏm'ĕ-lĕt* or *ŏm'lĕt* [F. *omelette*—from OF. *alemelle*, a thin plate—from L. *lamĭna*, a thin plate]: a kind of pancake, chiefly of eggs. These are broken; and their contents in a proper vessel are whipped into a froth, which is then poured into a very clean and dry frying-pan, with the addition of lard or butter to prevent sticking, and then fried carefully, so that the outside is nicely browned. Before frying, one of a number of ingredients may be added to vary the omelette, such as chopped savory herbs, minced ham or bacon, salt-fish, shell-fish, game, etc. Or sweet omelettes may be made by placing preserved fruits upon them when quite or nearly cooked. The O., though simple, requires skill for successful preparation.

OMEN, n. *ō'mĕn* [L. *omen*, a token of good or bad luck—*ominis*, of an omen]: a sign foreboding good or evil; a prognostic or presage. The interpretation of omens was extremely arbitrary. It was supposed that evil indicated as approaching might be averted by various means, as by sacrifices, or by utterance of certain magic formulas; or by an extempore felicity of interpretation, as when Cæsar, having fallen to the ground on landing in Africa, exclaimed: 'I take possession of thee, Africa.' Occasionally, there was reckless disregard of omens; e.g., when P. Claudius, in the First Punic War, caused the sacred chickens, who would not leave their cage, to be pitched into the sea, saying: 'If they will not eat, they shall drink.' Still the belief in omens was universal, and in general the greatest care was taken to avoid unfavorable omens. The heads of the sacrificial priests were covered, so that nothing distracting might catch their eyes; silence was enjoined at the commencement of every sacred undertaking, and at the opening of the *Ludi*. Before every sacrificial procession ran the heralds, calling on the people to 'pay respect to it,' and admonishing them to cease working till it should have passed, that the priests might not hear sounds of ill omen. At the beginning of a sacrifice, the aid of music was sought to drown whatever noises might prove unpropitious. Compare Auguries and Auspices: Divination. See also Fallati, *Ueber Begriff und Wesen des Rom. Omen* (Tüb. 1836.)—The belief in omens has existed in all ages and countries, and traces of it linger even yet in the most civilized communities; e.g., the dread at sitting down to table in a party of *thirteen*. Not a little of the philosophy of omens is contained in the Scottish proverb: 'Them who follow freits, freits follow;' meaning, that a fatalistic belief in impending evil paralyzes the endeavor that might prevent it. Omened, a. *ō'mĕnd*, containing a sign or token for good or evil. Ominous, a. *ŏm'ĭ-nŭs*, foreboding evil; inauspicious. Om'inously, ad. *-lĭ*. Om'inousness, n. *-nĕs*, the quality of being ominous.—Syn. of 'omen': prognostication; portent; indication; augury.

OMENTUM, n. *ō-mĕn'tŭm* [L. *omentum;* It. *omento*]: a membranaceous covering of the bowels placed immediately above the intestines, and inclosing more or less fat; the caul. Omental, a. *ō-mĕn'tăl*, belonging to the omentum. See Peritoneum.

OMER, n. *ō'mėr* [Heb.--see Homer]: a Heb. measure, being about 3·468 imperial quarts.

OMINOUS: see under Omen.

OMISSION, n. *ō-mĭsh'ŭn* [F. *omission*—from L. *omissĭōnem*—from *omissus*, passed over, neglected—from *ob*, down, away from; *mittĕrĕ*, to let go, to send: It. *omissione*]: neglect or failure to do; neglect of that which duty required to be done; failure to insert or mention. Omissible, a. *ō-mĭs'sĭ-bl*, capable of being omitted. Omis'sive, a. *-sĭv*, leaving out.

OMIT, v. *ō-mĭt'* [L. *omittĕrĕ*, to pass over, to neglect—from *ob*, away from; *mittĕrĕ*, to let go, to dismiss: It. *omettere:* F. *omettre*]: to leave out; to neglect or pass by; to fail to insert or mention. Omit'ting, imp. Omit'ted, pp.

OMMIADES, *om-mē'adz*, or **Omaiades**, or **Ommeyades**, or **Omayyads**: dynasty (named from an ancestor, Ommeyah) which succeeded to the Arabian caliphate on the death of Ali, fourth caliph after Mohammed, and possessed it till superseded by the Abbasides (q.v.) 750.—**Moawiyah**, founder of the dynasty, was son of Abu-Sofiau, who defeated Mohammed at Beder, and his mother was the notorious Hinda. After the death of Othman, the third caliph, Moawiyah his cousin claimed the throne, and during the whole of Ali's reign ruled over the w. provinces of Syria and Egypt; but it was not till the death of that caliph, and the abdication of his son Hassan 661, that Moawiyah's authority was fully recognized. In that year he transferred the seat of the caliphate to Damascus; Kufa having been the residence of Ali, and Medina of the first three caliphs. The Arabs continued to extend their conquests during his reign; the Turks in Khorassan were subdued, Turkestan invaded, and several important acquisitions made in Asia Minor. But besides aggrandizing his empire, the caliph neglected no means of consolidating it, and partly for this reason he made the succession hereditary, and caused his son **Yezid** (680–683) to be recognized as his heir.—The reigns of Yezid and his successors, **Moawiyah** II. (683) and **Merwân** I., previously the traitorous sec. of the caliph Othman (683–685), are devoid of importance, as their sway extended only over Syria and Palestine.—**Abdulmelek** (685–705), an able and warlike prince, after a long and varying struggle of eight years, made himself undisputed ruler of the Mohammedan world (692), but the latter part of his reign was much disturbed by rebellions in the e. provinces. He was the first caliph who interested himself in the promotion of liberal knowledge, by causing the most celebrated poetical and other works of the Persians to be translated into Arabic; and under his reign coined money was first introduced. It was to this prince that his court-fool related the celebrated fabulous conversation between the owl of Bassora and that of Mosul.—Four of his sons, **Walid** I. (705–716), **Suliman** (716–717), **Yezid** II. (720–723), and **Heshâm** (723–742), successively occupied the throne, and a fifth son, Mosslemah, was, from his great military abilities and zealous devotion to the interests of his brothers, the terror of all their enemies, both domestic and foreign. Under Walid, the Ommiade caliphate reached the summit of its power and grandeur; n. Africa (709) and Spain (712), Turkestan (707), and Galatia (710) were conquered; and toward the close of his reign his empire extended even to the Indus. The slender structure of the minaret was then introduced into mosque architecture.—**Omar** II. (717–720), who, in the justice and mildness of his government, surpassed all others of the race of Ommeyah, was appointed to succeed Suliman; but having excited discontent among his relatives by suppressing the formula of malediction, hitherto regularly pronounced at all public ceremonies against Ali and his descendants, he was poisoned. During his reign, Mosslemah had completed the conquest of Asia Minor, and even compelled Emperor Leo to submit to the humiliation of walking beside his horse through the principal streets of Constantinople itself, and paying a large ransom (equivalent to about $700,000) for his capital.—Heshâm, though, like his immediate predecessor, fond of pleasure, possessed all the qualities necessary for a sovereign. The Greeks, who still strove for possession of Asia Minor, were repeatedly defeated: the fierce Turks of n. Persia and Turkestan were kept in stern subjection; and the civil affairs of the empire carefully and strictly administered. The death of Mosslemah, champion of the Ommiade dynasty, seems to have been the signal for insurrection; the descendants of Ali raised the standard of revolt, and no sooner were they subdued than Ibrahim, fourth in direct descent from Abbas the uncle of Mohammed, solemnly invested the celebrated Abu-Mosslem (stated to be a descendant of Koderz, one of the most distinguished heroes of Firdusi's admired work the *Shah-nameh*) with the arduous duty of enforcing his long-agitated claims to the throne. During this reign the progress of Arab conquest in w. Europe was checked by Charles Martel, who inflicted on the Arabs a severe defeat at Tours (732), and almost annihilated their army at Narbonne (736).—The reigns of **WALID** II. (742–743), **YEZID** III. (743–744), and **IBRAHIM** (744), though of ephemeral duration, were long enough to produce a complete disorganization of the empire; and though **MERWÂN** II. (744–750), next and last caliph of the house of Ommeyah, was both an able and politic ruler and a skilful warrior, the declining fortune of his family was beyond remedy. Abu-Mosslem, who had published the claims of the Abbasides amid the ruins of Meru 747, took the field at the head of a small but zealous band, and carried the black flag of the Abbasides from victory to victory, till before the close of the following year the whole of Khorassan acknowledged his authority. Irak was subdued 749; and though Ibrahim the Abbaside claimant was seized by Merwân and put to death the same year, his brother Abul-Abbas succeeded to his claims, and the unfortunate caliph, defeated in two engagements, fled to Egypt (750), whither he was pursued and where he was slain. Abdallah, uncle of the successful claimant, treacherously invited the remaining members of the house of Ommeyah to a conference, and ordered a general massacre of them. Two only escaped: one to s.e. Arabia, where he was recognized as caliph, and his descendants reigned till the 16th c.; the other, Abderrahman, to Spain, where he founded the caliphate of Cordova.

OMMIADES OF SPAIN.—**ABDERRAHMAN** I. (755–787), accepting the Spanish throne offered him by the Arab chiefs, assumed the titles *Caliph* and *Emir-al-mumenin*, and, in spite of numerous revolts, strengthened and extended his power in Spain, till, with the exception of Asturias and the country n. of the Ebro, his authority was everywhere acknowledged. His defeat of Charlemagne at Roncesvalles (q.v.) was notable. He divided his kingdom into six provinces, whose rulers, with the *walis* of the 12 principal towns, formed a sort of national diet.—His successors, Hesham I. (787–796) and Al-Hakem I. (796–821), were much troubled with internal revolts, under cover of which the Christians in the n.e. established the state known as the 'Spanish March.'—Abderrahman II. (821–852) re-established internal quiet, and occupied his subjects with incessant wars against the Christians, in which was developed among the Arabs a chivalrous heroism found nowhere else in the Mohammedan world. Abderrahman, a man of learning, greatly encouraged the arts and sciences, and diffused information among his people; he also attempted, by regulating the laws of succession to property, to constitute his kingdom on a basis analogous to that of other European nations. During his reign Mohammedan Spain was the best governed country in Europe.—His successors, Mohammed I. (852–880), Mondhar (880–882), and Abdallah (882–912), followed in his footsteps.—Abderrahman III. (912–961), after suppressing some dangerous revolts which had gathered head during his minority, conquered the kingdom of Fez from the Edrisites, and brought a long and exhausting war with the powers of Asturias and Leon to a victorious conclusion. This period is justly termed the golden age of the Arab domination in Spain; at no other time was their power so consolidated, and their prosperity so flourishing. Abderrahman, like his predecessors, was a great encourager of learning, and a poet of some ability. He founded schools which far surpassed those in other parts of Europe.—His son, Al-Hakem II. (961–976), was in every way worthy to be be his successor, but his premature death was the cause of the downfall of the Ommiades in Spain.—Hesham II. (976—about 1013), a child of eight years, succeeded to the throne; but fortunately his mother, Sobeiha, had abilities necessary for such an emergency, and appointed as her son's vizier Mohammed ben Abdallah, surnamed Al-Mansor, originally a peasant. This remarkable man gained the affections of all ranks by his pleasing manners and great abilities; his administration was equally just and judicious, and his encouragement of literature, science, and art alike liberal and discriminating. But it is as warrior chiefly that he is remembered; he had vowed eternal enmity to the Christians, and in all his numerous expeditions fortune seemed chained to his standard. The lost provinces were recovered; Castile, Leon, and Barcelona were conquered; and Navarre was on the point of sharing the same fate, when a rebellion in Fez compelled him to detach a portion of his force for service in Africa, and the combined armies of the four Christian monarchies, seizing this opportunity, inflicted on the Arabs a sanguinary defeat, 1001. Mohammed's spirit was completely broken by this blow, and he died a few days afterward. With him the star of the house of Ommeyah set forever. The rest of Hesham's reign was a scene of disorder and civil war. Pretenders to the caliphate arose, while the 'walis' of the various provinces set up as independent rulers, and the invasions of the Christians added to the confusion. Hesham finally resigned the throne about 1013; and, except the brief reign of Hesham III. (1027–31), from this time the family of Ommeyah, which had for more than two centuries so happily and brilliantly governed the greater part of Spain, disappears from history. One remarkable feature of their rule deserves mention—their universal toleration in religion—contrasting favorably with the contemporary and subsequent rulers of Spain, even to the present time.

OMNI-, *ŏm'nĭ-* [L. *omnis*, all]: a prefix meaning 'all; wholly.'

OMNIBUS, n. *ŏm'nĭ-bŭs* [L. *omnĭbus*, for all—from *omnis*, all]: a large public carriage for conveying passengers short distances, generally in cities and towns. Vehicles of this sort were started first in Paris 1662, by a royal edict of Louis XIV., for the infirm, or those unable to afford a hired carriage. The omnibuses were for some time monopolized by the wealthier classes, and when the novelty had ceased, they gradually disappeared. They re-appeared in Paris 1827, carrying 15 to 18 passengers inside; and 1829 they were introduced into London by a Mr. Shillibeer, whose conveyances, long known as *shillibeers* (an epithet said to have been in common use also in New York), were larger than the French, carrying 22 passengers inside, and drawn by three horses abreast. The omnibus was introduced into Amsterdam 1839, and its use has since been extended to all large cities and towns in the civilized world. The seats are usually placed lengthwise, and the door behind; and the vehicle is managed by a driver and a conductor. In New York, omnibuses, which formerly thronged the principal streets, have given place to street-cars which are really omnibuses drawn on railways. The same change is taking place in other Amer. cities, and is rapidly extending in Great Britain, where the vehicles are called tramway-cars.

OM'NIBUS BILL (Henry Clay's Compromise 1850): see Compromise Measures.

OMNIFARIOUS, n. *ŏm'nĭ-fā'rĭ-ŭs* [L. *omnĭfā'rĭus*, of all sorts—from *omnis*, all; *vărĭus*, different]: of all varieties, forms, or kinds.

OMNIFEROUS, a. *ŏm-nĭf'ėr-ŭs* [L. *omnis*, all; *fero*, I produce]: bearing or producing all kinds.

OMNIFIC, a. *ŏm-nĭf'ĭk* [L. *omnis*, all; *fīō*, I am made]: all-creating.

OMNIFORM, a. *ŏm'nĭ-fawrm* [L. *omnis*, all; *forma*, shape]: of every form or shape. Om'nifor'mity, n. *-fŏr'mĭ-tĭ*, quality of having every form.

OMNIPARITY, n. *ŏm'nĭ-păr'ĭ-tĭ* [L. *omnis*, all; *par*, equal]: general equality.

OMNIPERCIPIENT, a. *ŏm'nĭ-pėr-sĭp'ĭ-ĕnt* [L. *omnis*, all; *percipiens* or *percĭpĭen'tem*, perceiving or understanding]: perceiving all things. Om'nipercip'ience, n. *-ĭ-ĕns*, perception of everything.

OMNIPOTENT, a. *ŏm-nĭp'ŏ-tĕnt* [L. *omnis*, all; *potens* or *poten'tem*, powerful]: all-powerful; almighty; having unlimited power: N. one of the titles of God. **OMNIPOTENTLY**, ad. *-lĭ*. **OMNIP'OTENCE**, n. *-tĕns*, unlimited or infinite power—applicable only to God; an attribute of God; also **OMNIP'OTENCY**, n. *-tĕn-sĭ*.

OMNIPRESENT, a. *ŏm'nĭ-prĕz'ĕnt* [L. *omnis*, all; *præsens* or *præsen'tem*, present]: present everywhere at the same time. **OM'NIPRES'ENCE**, n. *-prĕz'ĕns*, unbounded or universal presence; ubiquity.

OMNISCIENT, a. *ŏm-nĭsh'ĕnt* [L. *omnis*, all; *scientĭă*, knowledge; *sciens*, knowing]: all-knowing; infinitely wise. **OMNIS'CIENTLY**, ad. *-lĭ*. **OMNIS'CIENCE**, n. *-ĕns* [F.—L.], or **OMNIS'CIENCY**, n. *-ĕn-sĭ*, universal knowledge; knowledge unbounded or infinite.

OMNIUM, n. *ŏm'nĭ-ŭm* [L. *omnĭŭm*, of all—from *omnis*, all]: term at the stock exchange expressing the aggregate value of the different stocks in which a loan is funded. See M'Culloch's *Dictionary of Commerce*. **OMNIUM GATHERUM**, *ŏm'nĭ-ŭm găth'ĕr-ŭm* [L. *omnĭŭm*, of all, and slang L. *gathĕrum*, that which is collected]: a familiar phrase, denoting a miscellaneous collection of things or persons.

OMNIVOROUS, a. *ŏm-nĭv'ŏ-rŭs* [L. *omnĭvŏrus*, all-devouring—from *omnis*, all; *voro*, I devour or eat up]: feeding on both animal and vegetable substances.

OMOHYOID, a. *ō'mō-hī'oyd* [Gr. *ōmos*, the shoulder, and Eng. *hyoid*]: a name given to a muscle attached to the hyoid bone and the shoulder-blade.

OMPHACINE, a. *ŏm'fă sĭn* [Gr. *omphax* or *omphăka*, an unripe grape]: obtained or expressed from unripe fruit: N. the mixed oily matter pressed from green olives.

OMPHALIC, a. *ŏm-făl'ĭk* [Gr. *omphălos*, the navel or navel-string]: pertaining to the navel. **OMPHALOCELE**, n. *ŏm'făl-ŏ-sēl'* [Gr. *kēlē*, a swelling or tumor]: rupture or hernia of the navel. **OMPHALOTOMY**. n. *ŏm'făl-ŏt'ŏ-mĭ* [Gr. *tomē*, a cutting]: the operation of cutting the umbilical cord or navel-string.

OMPHALISM, n. *ŏm'făl-ĭzm* [Gr. *omphălos*, the navel]: government from the centre.

OMPHALODIUM, n. *ŏm'făl-ō'dĭ-ŭm*, or **OM'PHALODE**, n. *-lōd* [Gr. *omphălos*. the navel or navel-string; *hodos*, a way; or perhaps *eidos*, resemblance]: in *bot.*, the central part of the hilum of a seed through which nourishing vessels pass. **OMPHALOID**, a. *om'făl-oyd* [Gr. *eidos*, resemblance]: resembling the navel.

OMSK, *ŏmsk:* town of the Russian province of Central Asia, govt. of Akmollinsk; at the confluence of the Om—a river more than 200 m. in length—with the Irtish; 2,225 m. from St. Petersburg; lat. 54° 59′ n., long. 73° 30′ e. It was built 1716, as a defense against the Khirghiz; but is now of no importance as a fortress. It was till a recent date the centre of govt. for w. Siberia, centre of the administration of the Siberian Khirghiz, seat of the courts of justice, and of the Siberian corps of cadets. It contains manufacturies and mining works. Hitherto its commerce has been limited to a trade with the Khirghiz, who drive up their cattle to this place; but its advantageous position on the great post-road and commercial line of traffic from Europe across Siberia to the Chinese frontier, gives it some prospect of becoming an intermediate station for extensive commercial exchanges. Pop. (1880) 30,890.

OMUL (*Salmo migratorius*): fish of the salmon and trout tribe, abounding in Lake Baikal and other waters of e. Siberia, from which great quantities are sent salted to all the w. parts of that country. In size it is rarely more than 15 or 16 inches long. Its flesh is very white and tender. It ascends rivers in shoals for the purpose of spawning.

ON, prep. *ŏn* [Ger. *an;* Goth. *ana;* Dut. *aan,* to, upon: Gr. *ana,* up, on, upon]: above, and in contact with the upper surface of a thing; not off; upon; at or near; denoting dependence or reliance; denoting nearness or closeness; denoting addition or accumulation: AD. forward in progression; in continuance; without ceasing; opposed to *off.* ON A SUDDEN, suddenly. ON-GOING, procedure; event: ADJ. progressing; without intermission. ON-HANGER, one who attends on or follows closely, as an idler; a lounger—more usually *hanger-on.* ON-LOOKER, one standing looking on. ON THE WAY or ON THE ROAD, travelling; journeying; making progress. ON THE ALERT, in a state of vigilance. ON HIGH, above; in the heavens. ON FIRE, in a state of burning; in a rage or passion. ON THE WING, in flight; departing. To PUT ON, to attach to the body as, clothes or arms.

ON, int. *ŏn:* a word of excitement or encouragement to attack or advance; a contraction for *go on.*

ON, pron. *ŏng* [F.]: one; they. ON DIT, *ŏng dē* [F. they say, it is said]: a flying rumor or report.

ONAGER, n. *ŏn'a-jėr* [L.]: the wild ass: see ASS.

ONAGER, *ŏn'a-jėr:* ancient military engine: see BALLISTA.

ONAGRACEÆ, *ŏn-a-grā'sē-ē,* or ONAGRARIÆ, *ŏn-a-grā'-rĭ-ē,* or ŒNOTHERACEÆ, *ē-nŏth-ėr-ā'sē ē:* natural order of exogenous plants, chiefly herbaceous, but including a few shrubs; with simple leaves; axillary or terminal flowers; stamens generally four or eight, rarely one or two, inserted with the petals; the ovary generally 4-celled, sometimes 2-celled; the style threadlike, the fruit a capsule or a berry. There are several genera, and about 450 known species, natives chiefly of temperate climates, among which are some much cultivated for the beauty of their flowers, particularly those of the genera *Fuchsia, Œnothera* (Evening Primrose), *Clarkia,* and *Godetia.* (For Evening Primrose, see ŒNOTHERA.) The species are very numerous in America. A few species produce edible berries, and the roots of one or two are eatable; but none are of economical importance. The root of *Isnarda alternifolia,* found in the marshes of Carolina, and called *Bowman's Root,* is emetic. Some species of *Jussiæa* are used in dyeing in Brazil.

ONANISM, n. *ŏ'nă-nĭzm* [from *Onan*, of Scripture]: the sin of Onan; self-pollution; masturbation.

ONCE, ad. *wŭns* [a corruption of *ones*, the plu. of *one*, which see]: one time; one time but not more; a single time; all at one time; formerly: N. one time; the same time, as this once, that once. AT ONCE, at the same point of time; immediately. ONCE AND AGAIN, at repeated times; repeatedly.

ONCE, n. *ŏns* [F. *once;* Sp. *onza;* It. *lonza*]: a species of wild cat: see OUNCE 2.

ONCKEN, *ŏnk'ĕn*, JOHANN GERHARD: German Bapt. missionary: b. Varel, Oldenburg, 1800. After service as a domestic, and a visit to England, he sold books at Hamburg, joined an Eng. Congl. chh., and became agent of the Lower Saxony Tract Soc. and the Edinburgh Bible Soc. In 1834 he organized and became pastor of a Bapt. chh. The next year he travelled widely in Germany and Denmark as missionary of the Amer. Bapt. Convention. He was imprisoned in Hamburg for preaching and baptizing, but the good work of his church in relieving suffering consequent on a conflagration, 1842, led the govt. to commend and protect him and his flock. In 1852 he came to the United States, and collected money to build chapels. He edited a religious journal in English and one in German, was untiring in publishing tracts and editions of the Scriptures, and his work of distributing these and preaching extended to other parts of the German Empire and to Switzerland, some of the results reaching to s. Russia. After 30 years of labor the German Bapt. missions numbered 76 churches and over 11,000 members.

ONCOCAR'PUS: genus of trees of natural order *Anacardiaceæ*. One of the most remarkable trees of the Fiji Islands is *O. atra*, or *O. vitiensis*, a tree about 60 ft. high, with large oblong leaves and a corky fruit, somewhat resembling the seed of a walnut; the sap of which, if it comes into contact with the skin, produces a pain like that caused by red-hot iron. The wood is often called Itchwood, because of the effect produced on persons who ignorantly or incautiously strip off its bark while the sap is fresh, even the exhalations causing intolerable itching and innumerable pustules, with excessive irritation for several days: the effects continue to be unpleasantly felt for months.

ONCOTOMY, n. *ŏng-kŏt'o-mĭ* [Gr. *ongkos*, a tumor; *tomē*, a cutting]: in *surg.*, the opening of a tumor with a lancet or other cutting instrument.

ONDE, a. *ŏn'dĕ*, or ONDY, a. *ŏn'dĭ* [F.]: in *her.*, wavy; applied to charges, the edges of which are curved and recurved like waves.

ONDERDONK, *ŏn'dĕr-dŏnk*, HENRY USTICK, DD., LL.D.: 1789, Mar. 16—1858, Dec. 6; b. New York. He graduated from Columbia College 1805, studied medicine in Edinburgh, and practiced in New York; studied theology, was ordained priest in the Prot. Episc. Chh. 1816, and engaged in missionary work in Canandaigua, N. Y.; was rector of St. Ann's Church, Brooklyn, 1820–27, asst. bp. of Penn. 1827–36, and bp. of Penn. 1836, till his suspension on charges 1844. He was reinstated 1856. Among his books were *Episcopacy Examined and Re-examined*, *Essay on Regeneration*, and *Sermons and Charges*. He wrote several hymns, one of which, *The Spirit in Our Hearts*, is in use by nearly all evangelical denominations. He died in Philadelphia.—His brother, BENJAMIN TREADWELL O., DD., LL.D.: 1791, July 15—1861, Apr. 30; b. New York. He graduated from Columbia College 1809, was asst. minister in Trinity Church, New York, prof. in the Gen. Theol. Seminary in New York 1821–45, bp. of N. Y. 1830–45, and was suspended on charges in the latter year. He died in New York.

ON DIT, *ŏng dē* [F. one says, they say]: they say, people say; it is said. As a noun it is used to signify a current rumor, a flying report.

ONE, a. *wŭn* [Goth. *ains;* Ger. *ein;* W. *un;* Gael. and Ir. *aon*, one: L. *unus;* OL. *oinos;* Gr. *henos*, of one]: a single number; opposed to *another* or *other;* some or any; different; individual: N. a single person; a single thing. ONES, plu. *wŭnz*, persons. ONENESS, n. *wŭn'nĕs*, singleness; unity. ALL ONE, just the same. AT ONE, in union; in concord. ONE DAY, on a certain or particular day now past. ONE OF THESE DAYS, at some indefinite time. ONE O'CLOCK, the hour of one on the clock. ONE-EYED, a. having only one eye. ONE-SIDED, a. partial; limited to one side. ONE-SIDEDNESS, n. state of being partial.

ONE, n. *wŭn* [F. *on*, one, people, they—from OF. *om* or *omme*—from L. *homo*, a man]: used in an indefinite sense, any man; any person, as *one's* own choice, *one* may speak; a unity. ONE'S SELF, or ONESELF, I and not another. ONE ANOTHER [*one* + *one-other*], as in the phrase, they love *one another*, that is, each of them loves *the other*. *Note.*—ONE has been put into two separate entries, but the distinctions between them are not always apparent. Skeat affirms that ONE 2 is a mere adaptation of ONE 1.

-ONE, suff. *-ōn:* in *chem.*, suffix used as an abbreviation of acetone or ketone, thus, benzone, benzoic ketone. This termination is sometimes employed without definite meaning, as in quinone.

ONEGA, *o-nā'gâ:* small town and seaport in n. Russia, govt. of Archangel, 90 m. s.w. of the city of Archangel; lat. 63° 54' n., long. 38° 7' e. It stands at the mouth of a river, on the shore of the Gulf of O.; the latter a part of the White Sea. The people are employed in connection with the saw-mills of the 'Onega Trading Wood Company;' and about 50 ships leave the port annually for England, with cargoes of deals and timber to the value of £37,000. Pop. (1877) 2,309.

ONE'GA, LAKE: lake in n. Russia, govt. of Olonetz; after Ladoga, the largest lake in Europe; about 150 m. long, and 60 m. in greatest breadth; 3,720 sq. m. It is fed by numerous rivers, and receives through the river Wodlo the waters of the lake of that name. Its only outlet is the river Swir, which flows s.w. into Lake Ladoga. By means of the Mariinsky system of communication, Lake O. communicates with the Volga, and thence with the Caspian Sea on the south, and with the Dwina, and thence with the White Sea on the north. The clear and beautiful waters of this lake are rich in fish, and embrace many islands. The depth ranges from 550 to 700 ft. A peninsula divides it into n. and s. portions: the s. portion has few islands, and a not very irregular shore; the n. portion is greatly indented with inlets, and has numerous islands and submerged islands, making navigation dangerous. This danger is avoided by means of the Onega canal, which extends from Vytegra on the Vytegra river to the river Swir.

ONEGLIA, *o-nāl'yâ:* town of n. Italy, province of Porto Maurizio, on the Gulf of Genoa, 40 m. e.n.e. from Nice, at the mouth of the Impero, a small river which rushes down from the Apennines. The harbor is not good. The principal article of export is oil. Andrea Doria, great Genoese admiral, was born here. Pop. about 8,000.

ONEIDA, *ō-nī'da:* village in Lenox tp., Madison co., N. Y.; on Oneida creek, and the New York Central and Hudson River, and the New York Ontario and Western railroads, 26 m. from Syracuse, 27 m. from Utica; in a fertile region, and a centre of the hop-growing industry. It has several churches, good schools and a seminary, one semi-weekly and three weekly papers, one savings bank, two private and two national banks, and an extensive trade with the surrounding region. There are also large manufacturing interests. Pop. of Lenox township (1890) about 6,000.

ONEI'DA COMMU'NITY: see PERFECTIONISTS.

ONEI'DA LAKE: lake in the central part of N. Y.; within the limits of Madison, Oswego, Oneida, and Onondaga counties, about 12 m. n.e. of Syracuse. Its greatest width is 6 m., its length 20 m., and its elevation 369 ft. above sea-level. Oneida river, 18 m. in length, forms its outlet and leads to the Oswego river. The lake is well stocked with fish. Before the building of railroads the lake and river were largely used in the transportation of freight and passengers.

ONEIDAS, *o-nī'daz:* tribe of N. American Indians whose territory extended from Deep Spring, near Manlius, Onondaga co., N. Y., to a point below Utica. Their name signifies 'tribe of the granite rock,' and their totem was a stone in a forked stick. They were a secondary tribe, set apart from the Mohawks, and were comprised in the Six Nations. They were divided into three clans and had nine sachemships. They joined the Onondagas in making peace with Canada 1653, and were visited by missionaries, who labored among them till the close of the century. Prior to that time they were very difficult to manage, being in constant conflict with the early French settlers of Canada and their allies, the Hurons and Montagnais. Their wars with the southern tribes had reduced them to about 150 warriors. They united in the general peace with the French 1700, Sep. 8, but were allies of the English in all subsequent wars. At the time of the revolution they were the only tribe in the great council of the Iroquois confederacy who espoused the cause of the colonists, and with the Tuscaroras, arrayed themselves against the English. As a result of this allegiance they were driven from their homes, their houses and church were burned, and their property destroyed. They received compensation from the United States by treaty 1794, Dec. They had previously ceded their lands to the state of N. Y., reserving a tract which was never to be sold or leased except in part. The Brotherton and Stockbridge Indians kept the lands which they had received from the O. The O. have practically disappeared as a reservation tribe, though they have special schools provided by the state. Those who are still among the communal Indians are on reservations other than those originally set apart for them. Some of the tribe emigrated to Canada and settled on the Thames, but the majority purchased a large tract on Green Bay, Wis., 1821, where they mingled with the white settlers and have become prosperous. Those who remained on their reservations near Utica were employed by their white neighbors, and now have their own farms and are advancing in prosperity. They have acquired a knowledge of agriculture and the mechanical arts, and have schools and churches. In 1873 there were 266 Oneidas in N. Y., mostly in the state reservation, near Oneida Castle, with 2 schools; 1,279 in Wis., on a reservation of 65,000 acres, with 240 children attending school out of 400; there is very little intemperance among them, and they have many well-cultivated farms; the band on the Thames, Ontario, numbers 633, making in all, 2,178.

O'NEILL, *o-nēl'*, ELIZA (Lady BECHER): 1795–1872, Oct. 29; b. Ireland; daughter of John O'N., actor. She was educated for the stage, and made her first appearance in London 1814, as the Duke of York in Richard III. In spite of the severe struggles of her early life she attained the highest rank as a tragic actress. Her principal parts were *Juliet*, *Jane Shore*, *Mrs. Haller*, *Belvidera*, and *Mrs. Beverley*. She married, 1819, W. Wrixon Becher, M.P., of Ballygiblin Castle, co. Cork, who was made a baronet 1831, and died 1850. She died at her country-seat, Ballygiblin, near Mallow.

ONEIROMANCY, n. *ŏ-nī'rō-măn'sĭ* [Gr. *oneiros*, a dream; *mantei'a*, divination]: divination by dreams.

ONEROUS, a. *ŏn'ér-ŭs* [L. *onerōsus*, burdensome—from *onus*, a burden: It. *oneroso;* F. *onéreux*]: heavy; burdensome; oppressive: in *Scotch law*, being of mutual advantage. **ONEROUS CAUSE**, in *Scotch law*, a pecuniary or valuable consideration. **ON'EROUSLY**, ad. *-lĭ*.

ONICOLO, n. *ō-nĭk'ŏ-lō*, or Nicolo, n. *nĭk'ŏ-lō* [Gr. *nikolāōs*, a proper name]: a variety of onyx with a deep-brown ground, on which is a band of bluish white, used for making cameos.

ONION, n. *ŭn'yŭn* [F. *oignon*—from L. *unĭō*, a pearl, but found in Columella, signifying a kind of onion—from *unus*, one]: name given to a few species of the genus *Allium* (q.v.); particularly to *A. cepa* (Lat. *cepa*), a biennial bulbous-rooted plant, with swelling stem, leafy at the base, tapering fistular leaves, a reflexed spathe, a large globose umbel, usually not bulbiferous, the lobes of the perianth obtuse and hooded, not half as long as the stamens. The bulb is simple—not composed of cloves, like that of garlic; and in the common variety is solitary, showing little tendency to produce lateral bulbs. The native country of the O. is not known, some supposing it to be India and some Egypt, in both of which it has been cultivated from the most remote antiquity. The part chiefly used is the bulb, but the young leaves also are used, and young seedlings drawn from onion beds are used in soups and sauces: these are known in Scotland as *syboes* (evidently another form of the word *Cibol*). In warmer climates, the O. produces a larger bulb, and generally of more delicate flavor; and is used more as food, instead of as mere condiment. In Spain and Portugal, a raw O. is often eaten like an apple, and often with a piece of bread forms the dinner of a working-man. The O. is very nutritious. The oil, which is somewhat acrid, is dissipated and the O. made more digestible by boiling. The O. usually stimulates the organs of secretion and digestion, though with some stomachs it does not agree. It is an excellent expectorant, is valuable for poultices for some forms of sores, and is used as a remedy for various ailments of children. In medicinal qualities it is similar to Garlic (q.v.), but milder. The ordinary varieties of the O. succeed best n. of the 40th parallel of latitude, but from either seed or sets can be grown in all parts of the United States. Seed is principally used at the North and sets at the South. The crop can be grown on a variety of soils, but a rather sandy loam is to be preferred. The land should be rich, free from stones and from the seeds of weeds, and should be sown to carrots or some other carefully cultivated crop the year before it is sown to onions. It should be heavily manured in the fall, and plowed to a depth of about six inches. As soon as it can be worked in the spring, the surface must be thoroughly pulverized. The application of 100 bushels of hard wood ashes, 1,000 lbs. of superphosphate, or 1,000 to 2,000 lbs. of Peruvian guano and ground bone in equal proportions per acre, will greatly increase the crop. Heavy manuring and early sowing are indispensable. Rows should be from 14 to 18 inches apart, and perfectly straight to facilitate cultivation. A machine should be used for sowing, and a hand cultivator for working the soil between the rows. Four to six pounds of seed per acre is requisite—the smaller quantity being sufficient if the rows are wide apart, the seed fresh, and the land well fitted. The land should be rolled after sowing. Early and frequent cultivation must be given, and two or three weedings by hand will be needed. Weeds must be kept down at any cost. When the tops fall and the stalks turn yellow near the bulbs, the onions should be pulled and spread on the field to dry. They should be stirred occasionally, and as soon as the tops are well dried they are to be cut near the bulbs. The latter will then be ready for market. If stored, they must be kept in a cool, well ventilated place, and only a small quantity should be put in a single package. For growing sets, 30 to 60 lbs. of seed per acre will be needed. They will ripen in Aug., and must be promptly harvested and be kept cool and dry. Very small ones are best, and any exceeding one-half inch in diameter should be rejected. The maggot is the principal enemy of the O. Deep sowing, planting on new land, and prompt destruction of all infested plants, are the principal remedial measures. In the Middle States sowing for an early crop is sometimes done in the fall, but does not always prosper. Sets are to be planted two or three inches apart in drills as soon as the ground can be worked in the spring. They are sometimes put out in Oct. and left during the winter. Frequent cultivation must be given. Potato onions are grown from the small sections into which the bulb divides. When planted, these increase in size and give an early crop for use in a green state but are not desirable for keeping through the winter. Top onions are grown from small bulbs, clusters of which are produced on top of the stalks instead of seeds. The Bermuda O. grows to a large size, has a mild flavor, and is very productive. Immense quantities are imported, and of late, southern truck-growers have engaged in its cultivation. The seed must be grown in a cooler climate than that of Bermuda. There are about 80 varieties of the O. grown from seed in the United States. Among the most popular are the Yellow Danvers, Red Wethersfield, Silver Skin, Red Globe, and Southport Globe. The Giant Rocca, and White Tripol are Italian varieties that thrive in the South. The Yellow Danvers and Silver Skin are the most popular kinds for sets.

ONIS'CUS: see WOODLOUSE.

ONKELOS, *onk'ĕ-los:* supposed author of an Aramaic version (Targum) of the Pentateuch. The name seems a corruption from that of Akilas, one of the Greek translators of the Old Testament (see AQUILA). The translation, said to be by O., is, in its present shape at least, the work probably of the Babylonian schools of the 3d and 4th c. after Christ. At first orally transmitted, various portions began to be collected and written in the 2d c., and were finally redacted about the time above mentioned. For the history of the origin and growth of Aramaic versions in general, see TARGUM. The idiom of O. closely resembles that of Ezra and Daniel. The translation itself is in accord with a sober and clear, though not a slavish exegesis, and keeps closely to its text in most instances. In some cases, however, where the meaning is not clear, it expands into a brief explanation or paraphrase, uniting the latter sometimes with Haggadistic by-work, chosen with tact and taste, so as to please the people and not to offend the dignity of the subject. Frequently it differs entirely from the original, as far, e.g., as anthropomorphisms and anthropopathies—anything, in fact, which might seem derogatory to the Deity—are concerned. Further may be noticed a repugnance to bring the Divine Being into too close contact with man, indicated by the interposition of a kind of spiritual barrier (the 'Word,' 'Shechinah,' 'Glory') when a conversation, or the like, is reported between God and man. Its use lies partly in a linguistic, partly in a theological direction; but little has been done for its study as yet. Notwithstanding the numerous MSS. of it extant in almost all the larger libraries of Europe, and in spite of the grossly incorrect state of our current printed editions, no critical edition has ever been attempted.

ONLY, a. *ŏn'lĭ* [AS. *ænlic*, only—from *an*, one; *lic*, like]: single; one alone; this and no other: Ad. singly; merely; this and no otherwise; singly without more, as *only*-begotten.

ONOBRY'CHIS: see Saintfoin.

ONOCENTAUR, n. *ŏn'o-sĕn-tawr* [Gr. *onos*, an ass; *kentauros*, a centaur]: in *myth.*, a fabulous monster represented on ancient sculpture, with a body partly human and partly asinine.

ONOMACRITUS, *ŏn-o-măk'rĭ-tŭs:* priest and poet of anc. Greece, living at Athens, B.C. 530–480, in the time of the Peisistratidæ. He collected and expounded—according to Herodotus—the prophecies or oracles of Musæus (q.v.), but is said to have been banished from the city by Hipparchus, about B.C. 516, on account of interpolating something of his own in these oracles. He then, we are told, followed the Peisistratidæ into Persia, and while there was employed by them in a very dishonorable way. They got him to repeat to Xerxes all the ancient sayings that seemed to favor his meditated invasion of Greece. Some critics, among whom is Aristotle, have inferred from a passage in Pausanias that O. is the author of most of the so-called Orphic hymns. More nearly certain, however, is the view which represents him as inventor of the great Orphic myth of Dionysus Zagreus, and founder of Orphic religious societies and theology. Pausanias states that 'Onomacritus established orgies in honor of Dionysus, and in his poems represented the Titans as the authors of the sufferings of Dionysus.' See Orpheus: consult also the standard histories of Greece (as Grote's) and of Greek literature (as Mahaffy's).

ONOMANCY, n. *ŏn'ŏ-măn-sĭ*, or On'oman'tia, n. *-shĭ-ă* [Gr. *onŏma*, a name; *mantei'a*, divination]: divination by the letters of a name. On'oman'tic, a. *-tĭk*, or On'oman'tical, a. *-tĭ-kăl*, pertaining to onomancy; predicted by names, or the letters composing them.

ONOMATOLOGY, n. *ŏn'ŏ-mă-tŏl'ŏ-jĭ* [Gr. *onoma*, a name; *logos*, discourse]: a treatise on the derivation of names, or the study of them as a science. ON'OMATOL'OGIST, n. *-jĭst*, one who.

ONOMATOPŒIA, n. *ŏn'ŏ-mă-tō-pē'yă* [Gr. *onŏma*, a name; *poiĕō*, I make]: in *philology*, the formation of words in imitation of the sounds which they represent; as to *buzz* as bees, to *creak* as a door, to *crackle* as burning twigs: other examples are—*cuckoo*, Lat. *cucu*(lus); *pee-wit*, Scan., *pee-weip*, Dutch, *kie-wit; cock; clash, rap, tap, quack, rumble, whizz, clang*. Such words are sometimes called onomatopœias; more properly, they are onomatopœian, or formed by onomatopœia. ONOMATOPOETIC, a. *ŏn'ŏ-mă-tō-pō-ĕt'ĭk:* resembling the sound signified.

Onomatopœia, in a more extended sense, is applied to the rhetorical artifice by which writers (chiefly poets) seek, through the choice and arrangement of words, to make the 'sound,' throughout whole phrases and sentences, 'an echo to the sense,' as in Homer's well-known *poluphloisboio thalasses*, expressive of the breaking of waves upon the seashore; or where Tennyson makes the sea

Roar rock-thwarted under bellowing caves.

The occurrence of so many obviously onomatopœian words in all known languages suggests the question, whether the same principle may not have been concerned in producing the original germs or roots of the great bulk of words. There is little prospect that the question will ever be conclusively settled either way; for the changes of time have made it, in most cases at least, impossible to say what the first form and signification of a root were; but the weight of arguments seems in favor of the affirmative answer. 'The action of the mind,' as it has been expressed, 'produced language by a spontaneous repercussion of the impressions received.' Now, the articulate sound first affixed in this way to an object or an action as its sign cannot be conceived as arbitrary; nor is there any mysterious and inherent correspondence between any one conception of the mind, and a particular articulate sound. The sound uttered must have been suggested by something connected with the object or action itself; and by what more naturally than by the inarticulate sound which the object or action itself emits?

The chief objection to this theory is, that if the first words were merely reproductions of natural sounds, the same natural objects would have had the same names all the world over. To this it is answered, that the mind in its first efforts at naming did not seek an exact reproduction of the sound, but a suggestive imitation; primitive words were not echoes, but 'artistic representations.' Now, the sounds of nature are not simple, but composite. Like other concrete phenomena, they present a variety of aspects; and according as one or another aspect seemed most prominent to the observer, a different vocal sound would suggest itself as the appropriate symbol. Thus, when Prof. Max Müller argues (*Science of Language*, Lond. 1861) that if the 'bow-wow' theory, as he nicknames it, were true, men would have everywhere spoken of a *moo*, as is done in the nursery, and not of a *cow;* it seems a valid answer to say, that the Indian *gu*, the Teut. *kuh* (Eng. *cow*), and the Græco-Lat. *bou-*, are really as suggestive imitations of the animal's actual voice as *moo*. To take a more striking instance: few words differ more in sound and aspect than the Eng. thunder (Ger. *donner*, Lat. *tonitru*, Fr. *tonnerre*) does from the Mexican name for the same thing, *tlatlatnitzel*, and yet it would be difficult to say which is the more suggestive of the natural sound.

It is no doubt true that the great bulk of names are derived from roots having a general predicative power; but this by no means exculudes the principle of onomatopœia. Thus, to take one of the instances adduced by Prof. Müller, that of *raven* or *crow* (Skr. *kârava*, Lat. *corvus*, Gr. *korōnē*); this is derived from the root *ru* or *kru*, which means to cry or call, and the bird was called a *kârava*, or crow, not in imitation of his voice, but because he was 'a shouter, a caller, a crier. The name might have been applied to many birds, but it became the traditional and recognized name of the crow.' But how came the articulation *ru* or *kru* to be chosen to convey the general meaning of crying or calling; may we not suppose that it was suggested by the voice of birds of the crow kind, whose notes are most markedly cries or calls to their fellows, as distinguished from singing? Once adopted in this particular case, it would naturally be extended to any kind of cry or call, from the harshest to the softest.

ONONDAGA, *ŏn-on-daw'ga*, **Lake**: a lake in Onondaga co., N. Y., near Syracuse. It is 5 m. long by 1 m. wide; in some portions shallow, in others 65 ft. deep; and lies 361 ft. above the sea. It is near large salt springs, and is supposed to have been formed by the washing away of the salt rock which formerly occupied its location. Through a short outlet, the waters flow into Seneca river.

ONONDAGAS, *ŏn-on-daw'gaz:* one of the tribes of American Indians known as the Five Nations, or Iroquois. Their language was regarded as purer and stronger than the dialects of the other tribes, and was used at the meetings of the great council. At an early period the O. waged war with the Hurons and Algonquins, and later with the Eries and Susquehannas. They opened hostilities with the French, but made a treaty 1653, and requested the establishment of a mission. A settlement was made 1657, but the people fled the next year on the discovery of a plot to annihilate them. The O. invaded Montreal Island 1662, made peace, and allowed the re establishment of the French mission 1668. They became allies of the English, were punished by Frontenac 1696, made a treaty 1700, which they broke 1709. During the revolution the O. aided the English Most of their land was ceded to the state of New York 1788. About 400 O. live in Ontario, Can., a small number are with the Seneca and Tuscarora tribes, and about 350 are on a reservation about 4 m. sq. at the old home of the tribe a few m. from Syracuse. Schools are maintained and some of the people profess Christianity.

ONSET, n. *ŏn'sĕt* [*on*, and *set*]: a rushing or setting upon; a violent attack; first brunt.

ONSLAUGHT, n. *ŏn'slawt* [AS. *onslagan*, to destroy—from *on*, on; *slagan*, to strike, to slay]: attack; assault; onset.

ONSTEAD, n. *ŏn'stĕd* [a corruption of *homestead*]: *Scotch* and *prov. Eng.*, a farmhouse.

ONTARIO, *ŏn-tā'rĭ-ō*, LAKE: easternmost and smallest of the five great lakes of North America, lies in 43° 10′—44° 8′ n. lat., and 76° 30′—80° w. long.; 190 m. in length, 55 m. in greatest width, about 480 m. in circumference. At its s.w. corner it receives the waters of the upper lakes by the Niagara, and at its n.e. corner it issues into the St. Lawrence; which for some distance below is called the Lake of the Thousand Isles. Its surface, which varies a few ft. with the seasons, is about 330 ft. below that of Lake Erie and 234 ft. above tide-water. Its bottom, therefore, must be considerably lower than the level of the Atlantic, as it is in some places 600 ft. deep. Sufficiently deep throughout for vessels of the largest tonnage, it has many convenient and thriving ports, of which the chief are Oswego, Sackett's Harbor, and Charlotte in the United States; and Kingston, Port Hope, Cobourg, Toronto, and Hamilton on the Canadian shore. Its navigation has been facilitated by the erection of 15 light-houses on the United States side, and 13 on the Canadian; while it is connected with Lake Erie by the Welland canal, with the Erie canal and New York by the Oswego canal, and by the Rideau canal with the Ottawa. Lake O. is subject to violent storms, and it is probably owing chiefly to the constant agitation of its waters that it freezes for only a few miles from the shore. The shores of Lake O. are generally very flat, but the Bay of Quinte, a long crooked arm of the lake, which stretches about 50 m., has some attractive scenery. Burlington Bay, on which Hamilton lies, is a large basin, almost inclosed by a natural, but strangely accumulated bank of sand, which forms a beautiful drive.

ONTARIO, *ŏn-tā'rĭ-ō*, PROVINCE OF: province belonging to the Dominion of Canada (see CANADA), and formerly known as Upper Canada. The Ottawa river on the e. separates it from Quebec, formerly Lower Canada. It occupies most of the St. Lawrence valley w. of Quebec and n. of the Great Lakes. The area (1890) is given as 144,600 sq. m., but some additional territory is claimed. Pop. (1871) 1,620,851; (1881) 1,923,228; (1889, June) estimated 2,115,971. The pop. of the principal cities was estimated (1890) as follows: Toronto, provincial cap., 172,800; Ottawa, cap. of the Dominion of Canada, 42,020; Hamilton, 45,000; London, 26,047; Kingston, 18,000.

The peninsula between Lake Huron and Lakes Erie and Ontario is comparatively level and very fertile. The land around the Great Lakes is separated from the St. Lawrence valley by a range of hills, and in the upper part of the peninsula hills are interspersed with fertile valleys. In the n. and w. portions of the province are hilly and wooded regions. The Great Lakes and canals furnish a shore line about 3,000 m. in extent, and several of the rivers are navigable for long distances. The principal canals are the Welland, 27 m., and the Rideau 126½ m. long. The railroad interests of the province are well developed, and with the canals and the natural water-ways furnish great commercial advantages. The climate varies greatly with the locality. In the n. the winters are long and the cold intense, but in the s.w. it varies little from that of the n. United States. The dryness of the air makes the cold less uncomfortable than the mercury would indicate, and in the greater part of the province the climate is healthful.

The mineral resources are great, but only partially developed. Iron ores, galena, apatite, freestone, granite, and marble are found in the e. and central portions; and in other parts of the province, especially in the n.w., are deposits of gold-bearing quartz, silver, zinc, copper, and nickel; veins of plumbago, and immense quantities of fine marble; slate for roofing purposes, millstones, and grindstones. There are also large quantities of limestone, clay suitable for brick and tile, gypsum, and marl. In the s.w. part of O. are remarkably productive petroleum wells, and great quantities of salt are made from brine obtained from wells at and near Goderich. The lumber interest is extensive, and large quantities of pine are exported. Oak and various other hard-wood trees abound, and a great variety of the soft woods. To a certain extent the forests are controlled by law. The fisheries are important and are under govt. supervision. Among the animals are deer, elk, bear, beaver, wolf, fox, otter, and raccoon, and there are wild turkeys, geese, ducks, partridges, and other valuable game-birds. Of the cultivated crops, wheat, barley, oats, rye, peas, and corn are largely grown and large quantities of clover seed are produced. Roots, especially turnips and mangolds, are grown for stock, and potatoes yield large crops. Beans, buckwheat, hemp, hops, sorghum, and tobacco are grown in limited areas. Apples, pears, peaches, plums, and cherries, and the various small fruits thrive in portions of the province. The live-stock and dairy interests are important. In 1887 there were 737 cheese factories in operation, which made 65,638,656 lbs. of cheese valued at $6,918,913. The same year 1,136,576 lbs. of butter were made, valued at $230,022. Tile draining is extensively practiced, and improved farm implements and machines have been largely introduced. An experimental farm has been established at Ottawa by the Dominion govt. for Ontario and Quebec; and at the farmers' institutes, opened 1884, lecturers are employed by the govt. The new cabinet office of Minister of Agriculture was created 1888. Manufactures are not very extensive, but include agricultural implements and machines, sewing-machines, edged tools, woolen and cotton goods, boots, shoes, wooden ware, stoves, hardware, paper, carriages, and furniture. Imports, for the year ending 1886, June 30, $39,069,475; exports, $27,088,868.

A lieut.gov., appointed by the gov.gen. of the Dominion, is at the head of the provincial govt. There is but one legislative body: it has 88 members, elected for a term of 4 years. In the Dominion Parliament O. has 24 senators and 92 members of the House of Commons. The former are appointed by the gov.gen.: the latter are elected. Receipts for the year 1888–9, $3,587,421.78; expenditures, $3,536,248.46. Assets of the province, $7,122,455.58; liabilities, $387,805.73. Surplus, $6,734,649.85.

Education receives much attention. Schools are thoroughly graded and under govt. control. There are more than 100 high schools and collegiate institutions; 2 normal schools; a fine university, and the Upper Canada College, at Toronto; many Rom. Cath. and other denominational institutions of learning, and an agricultural college at Guelph. By act of the govt. 1887 the English language is required to be taught in every public school. In many schools French had been the only language used. Of the religious denominations the various Meth. bodies are most numerous; the Anglican church has 3 dioceses; the Rom. Cath. Church has 1 archbishop and 4 bishops; and the Congl., Baptists, Presb., and other denominations have large memberships.

Trading posts were established in O. early in the 17th c., but it was not permanently settled till long afterward. It was ceded, with the remainder of Canada, to Great Britain by France 1763; was merged in the province of Quebec 1774; was separated and known as Upper Canada 1791; reunited with Quebec and called Canada 1841; was again separated, became the province of Ontario, and united with the other provinces in forming the Dominion of Canada 1867. During the war of 1812 several battles were fought on its territory, a rebellion occurred 1837–8, and it was invaded by Fenians 1866.

ONTENIENTE, *ŏn-tā-nē-ĕn'tā:* town of Spain, province of Valencia, 45 m. s. by. w. from Valencia; on the right bank of the Clariano, near the railway which connects Valencia with Madrid. Linen and woolen fabrics are manufactured here; there are also numerous oil-mills. Pop. (1877) 11,727.

ONTOGENY, n. *ŏn-tŏj'ĕn-ĭ* [Gr. *ōn* or *ŏnta*, being; *gennăō*, I generate, I produce; *gĕnos*, birth, race; *gennĕtos*, born]: the science of life or being; the history of the evolution of individual organisms, as distinguished from their *phylogeny* or race history. ONTOGENETIC, a. *ŏn'tō-jĕn-ĕt'ĭk*, of or pertaining to.

ONTOLOGY, n. *ŏn-tŏl'ŏ-jĭ* [Gr. *ōn* or *ŏnta*, being; *logos*, discourse]: that part of metaphysics which attempts to investigate and explain the nature and essence of all beings (see METAPHYSICS). ONTOLOGIC, a. *ŏn'tŏ-lŏj'ĭk*, or ON'TOLOG'ICAL, a. *-ĭ-kăl*, pertaining to being and its attributes. ON'TOLOG'ICALLY, ad. *-lĭ*. ONTOLOGISM, n. *-jĭzm* [L. *ontologismus;* F. *ontologisme*]: in *phil.* and *chh. hist.*, a form of Platonic mysticism, the chief tenet of which is that the human intellect has an immediate cognition of God as its proper object, and the principle of all its cognitions. ONTOL'OGIST, n. *-tŏl'ŏ-jĭst*, one who treats of the nature and qualities of being in general.

ONUS, n. *ō'nŭs* [L. *onus*, the burden]: the first word of the L. phrase ONUS PROBANDI, *ō'nŭs prō-băn'dī*, the burden of proving; the burden or obligation; the task. In law, the *onus probandi* is often a difficult question in litigation; but as a general rule, the plaintiff who institutes the suit is bound to give proof of the allegations on which he relies. There are many nice and technical rules on the subject, both in suits and in actions.

ONWARD, a. *ŏn'wėrd* [AS. *cnweard*—from *on*, in, upon, and *weard*, expressing direction]: increased; advanced; progressing; improved; leading forward. ON'WARD, ad., or ON'WARDS, ad. *-wėrdz*, toward a state of advanced progression; a little farther or forward; progressively.

ONYCHA, n. *ŏn'ĭ kă* [Gr. *onux* or *on'ŭcha*, a claw, a nail: L. *onyx*]: the shell of the E. India onyx-fish; the onyx.

ONYCHIA, n. *ŏn-ĭk'ĭ-ă* [Gr. *onux* or *on'ŭcha*, a claw, a nail]: a disease of the nail; a whitlow.

ONYCHOMANCY, n. *ŏn'ĭ-kō-măn'sĭ* [Gr. *onux* or *on'ŭcha*, a claw, a nail; *mantei'a*, divination]: divination by the appearance of the nails of the fingers.

ONYX, n. *ŏn'ĭks* [Gr. *onux;* L. *onyx*, a nail of the hand]: general name for those varieties of the agate which consist of alternate layers of white, brown, or black; rarely, a third color of stripes occurs. The finest specimens are brought from India. O. is in much esteem for ornamental purposes. The ancients valued it very highly for cameos. Many of the finest cameos in existence are of onyx. The name O., however appears to have been applied by the ancients more extensively that it now is, and even to striped calcareous alabaster, such as is now called Onyx Marble (q.v.). The *Sardonyx* of the ancients is a variety of O., in which white stripes alternate with stripes of a dark-red variety of carnelian, called *sard* or *sarda:* it is one of the rarest and most beautiful kinds of O., and is more valued than carnelian.—In *ophthalmology*, O. is an abscess of the cornea of the eye, by which it becomes opaque.

ON'YX MAR'BLE: very beautiful material, which came into general notice first at the London Exhibition of 1862. It is a stalagmitic formation, discovered by the French in making roads in the province of Oran in Algiers. It is a translucent limestone, containing traces of magnesia and carbonate of iron; specific gravity 2·730. Artistic workmen of France manufacture of it very beautiful ornamental works.

OODEYPUR': see ODEYPOOR.

OOGONIUM, n. *ō'ŏg-ō'nĭ-ŭm*, O'OGO'NIA, n. plu. *-ō'nĭ-ă* [Gr. *ōŏn*, an egg; *genos*, offspring]: the special organ in which the oosphere is contained; a kind of ovarian sac containing spores which form oospores or zoospores when set free.

OOJEIN': see UJEIN.

OOLACHAN: see CANDLE-FISH.

OOLITE, n. *ō'ŏ-līt* [Gr. *ōŏn,* an egg; *lithos,* a stone]: variety of limestone—often very pure calcareous spar; named from its being composed of small rounded grains resembling the eggs or roe of a fish, connected by a calcareous cement: it is sometimes called roestone. The grains are frequently hollow. Many oolites are excellent building-stones. There is no important mineralogical difference between O. and *Pisolite,* or pea-stone. O., as a geological term, is extended far beyond its mineralogical and original signification. In *geol.* O. is a secondary formation or system; same as *Jurassic:* see JURA: JURASSIC. OOLITIC, a. *ō'ŏ-lĭt'ĭk*, pert. to the Oolite system, or classed with it: see OOLITE (or JURASSIC) GROUP (below). OOLITHES, n. plu. *ō'ŏ-lĭ'thēz* or *ō'ŏ-lĭthz,* a general term for the fossil eggs of birds, reptiles, etc.

O'OLITE (or JURAS'SIC) **GROUP** (in Geology): extensive and important series of strata of secondary age, underlying the chalk formation, and resting on the Trias. In Britain they received the name Oolite, because in the district where they were first examined and described by Dr. William Smith, the limestones contained in them had an oolitic structure (see OOLITE, above). The name Jurassic has been given to them on the European continent, because the range of the Jura Mountains in n.w. Switzerland is almost entirely composed of them (see JURA). The strata have been arranged in the following order. The maximum thickness of each division is given in feet.

	Feet.	
UPPER OOLITE.		
1. Purbeck Beds	200	
2. Portland Beds	170	
3. Kimmeridge Clay	600	
		970
MIDDLE OOLITE.		
4. Coral Rag	190	
5. Oxford Clay	600	
		790
LOWER OOLITE.		
6. Cornbrash and Forest Marble	80	
7. Great Oolite and Stonesfield Slate	150	
8. Fuller's Earth	150	
9. Inferior Oolite	250	
		630
LIAS.		
10. Upper Lias	300	
11. Marlstone	200	
12. Lower Lias	600	
		1100
Total		3490

It is apparent from this table that the oolitic rocks consist of three extensive clay deposits, each the basis of a smaller and variable set of sands and limestones; the Upper Oolites resting on the Kimmeridge Clay, the Coral Rag on the Oxford Clay, and the Lower Oolite on the Lias.

1. The Purbeck beds, unlike the other oolitic rocks, are chiefly freshwater deposits. Though lithologically they are very similar throughout, the peculiarities of the contained fossils have caused them to be grouped into three series—the Upper, Middle, and Lower. The Upper Pur-

becks are purely freshwater, containing beds of limestone and shale, which abound in shells of lake and river mollusca and cyprides. The stone called Purbeck Marble, formerly extensively used in the ornamental architecture of English churches and other buildings, belongs to this division; it consists of the shells of Paludinæ. held together by a somewhat argillaceous paste. The Middle Purbecks are partly freshwater, and partly brackish or marine. The 'cinder-bed,' composed of a vast accumulation of shells of *Ostrea distorta*, occurs in this section, and near it is the narrow layer from which were obtained the remains of several mammalia. The Lower Purbecks are chiefly freshwater, with some intercalated brackish or marine beds, and one or two old vegetable soils called by the quarrymen 'dirt-beds,' which contain stems of Cycadaceous and Coniferous plants. 2. The Portland beds consist of oolitic and other limestones interstratified with clays, and passing below into sands and sandstones, from which the well-known building-stone is obtained, of which St. Paul's and many principal buildings in London are built. 3. The Kimmeridge Clay is generally a dark-gray bituminous shale, with intercalated beds of sand, calcareous grit, and layers of septaria: the dark shale in some places passes into an impure brown shaly coal. 4. The Coral Rag contains, as its name implies, abundance of corals, in bluish limestone beds mixed with layers of calcareous grit: the Solenhofen lithographic stone, with its beautifully preserved and varied fossil remains, belongs to this division. 5. The Oxford Clay is a dark-blue or blackish clay without corals, but having a large number of beautifully preserved Ammonites and Belemnites: beds of calcareous sandstone, called Kelloway Rock, occur in its lower portion. 6. The Cornbrash consists of thin beds of cream-colored limestone, with sandstones and clays; and the Forest Marble (so named from Wychwood Forest) is composed of an argillaceous limestone, with numerous marine fossils, blue marls and shales, and yellow silicious sand: at Bradford, Wiltshire, the Forest Marble is replaced by a considerable thickness of blue unctuous clay. 7. The Great Oolite is composed of shelly limestones, sandstones, and shelly calcareous sandstones, and the Stonesfield Slate is a slightly oolitic shelly limestone, which splits into very thin slabs, erroneously called 'slates;' it is remarkable for the remains of terrestrial reptiles and mammals found in it: the Bath Oolite, well-known building stone, belongs to this division. 8. The Fuller's Earth group is a local deposit found near Bath; it consists of a series of blue and yellow shales and marls, some of which have properties fitting them for the use of the fuller. 9. The Inferior Oolite is composed of a series of beds of pisolitic and shelly limestones, brown marl, and brown sandy limestone, all abounding in fossils. 10. The Lias (q.v.) is a great clay deposit; divided into the Upper and Lower Lias, which consist of thin beds of limestone scattered through a great thickness of blue clay, and, separating these two groups, the Marlstone, or calcareous or ferruginous sandstone: the Lias abounds in beautifully preserved fossils.

OOLITE GROUP.

The oolite occupies, in England, a zone nearly 30 m. in breadth, extending across the country from Yorkshire to Dorsetshire. On the continent of Europe rocks of this age occur in Germany and France, but they have been most extensively studied in the Jura Mountains, 6,000 ft. in height, composed of oolite and cretaceous rocks. The strata are greatly bent and contorted, and as they approach the Swiss Alps, the great mass of which also is of oolite, they become completely metamorphosed into clay slates, mica schists, gneiss, and crystalline limestones. Beds of O. have been noticed in Cutch, in India. In Australia similar beds occur on the western coast, and probably some of the coal-beds of New South Wales, Victoria, and Tasmania belong to the oolite. In N. and S. America, fossils, apparently of oolitic age, have been found in the e. ranges of the Rocky Mountains, and on the w. side of the watershed; but these deposits require to be more exactly examined. So far as known the O. is of unimportant extent in N. America.

The O. is remarkable for the abundance of its fossils, and is in this respect in striking contrast to the immediately preceding Triassic and Permian periods. The several freshwater deposits, and the ancient vegetable surfaces, contain the remains of a considerable number of plants. Ferns abound, and associated with them are species evidently related to the living genera *Cupressus*, *Araucaria*, and *Zamia*.

Corals abound in several of the beds. The brachiopods are the only division of mollusca not largely represented. The conchifers and gasteropods show a great number and variety of new genera, nearer the forms of the present day than those that preceded them. But the remarkable feature of molluscan life is the enormous development of the cephalopods. Whole beds are almost entirely of their shells. No less than 600 species of ammonites have been described, chiefly from the rocks of this period, and the belemnites also were very numerous. The crinoids have become scarce, but are replaced by star-fishes and sea-urchins. The freshwater beds contain the remains of many insect forms. The heterocercal-tailed fish give way to the more modern homocercals, and the true sharks and rays make their appearance, though the old cestracionts are still represented by some survivors. The characteristic feature of the oolitic period was its reptiles. The land, the sea, and the air had each their inhabitants of this class. The various species of pterodactyles, some not larger than the bat, others surpassing, in the stretch of their membranous 'wing,' the size of the largest living bird, were the terrors of the air; while their allies, the monster ichthyosaurs and plesiosaurs, held the mastery of the waters; and the huge megalosaurs, some not less than 30 ft. in length, trod the earth. The few mammalian remains hitherto found, have special interest from their antiquity, being the first evidence of this high order of animals on the globe. They belong, apparently, to marsupial animals; one species is, however, supposed by Owen to have been a hoofed and herbivorous placental mammal.

OOLOGY, n. *ō-ŏl'ŏ-jĭ* [Gr. *ōŏn*, an egg; *logos*, discourse]: the science that deals with eggs in relation to their size, shape, color, etc., and with the nests of birds.

OOMRAWUTTI, *ôm-ra-wŭt'tē*, or AMRAWATI, *âm-ra-wât'ē:* important commercial town of Brit. India, province of Berar, 86 m. w. by. s. from Nagpore, on one of the headwaters of the Purna, a branch of the Tapti. The dist. which contains it was ceded by the Nizam to the British govt.; and transit-duties, which formerly interfered with the commerce of the town, have been abolished. Several considerable business firms are established here; and the chief merchants of Upper India and of Bombay have agents, who often make advances to the cotton cultivators of the surrounding country, on security of their crop. There are large cotton warehouses at Oomrawutti. Pop. (1881) 23,550.

OONALAS'KA: see UNALASHKA.

OONOSCOPE, n. *ō-ŏn'ō-skōp* [Gr. *ōŏn*, an egg; *skopĕō*, I see]: a contrivance, with two eye-pieces for inspecting eggs and ascertaining their quality.

OOPHORIDIUM, n. *ō-ŏf'ŏr-ĭd'ĭ-ŭm* [Gr. *ōŏn*, an egg; *phoros*, fruitful—from *pherō*, I bear]: in *bot.*, an organ in the Lycopodiaceæ containing large spores.

OO'RALI: see WOORALI.

OORALSK': see URALSK.

OORFA, or URFA, *ôr'fâ:* modern name of EDESSA, which see.

OOR'GA: see URGA.

OORI, *ô'rĭ* (or LIMPOPO, *lĭm-pō'pō*), RIVER: important river system of s.e. Africa, rising lat. 26° s. in the high plateau called the Magaliesberg, which forms the n. limit of the basin of the Orange river. Throughout a great part of its course, the Limpopo bounds on the n. the Transvaal territory which its s. affluents drain. It flows n.e. through the plateau in which it rises, then turns sharply s.e. and s., entering the lowlands. It reaches the Indian Ocean about 100 m. n. of Delagoa—considerably further s. than was till recently supposed. Its course cannot be less than 800 or 900 m.; and it has numerous large tributaries, the Mariqua, Lipalula, etc. Yet, like most s. African rivers, it is navigable only 60 m. from its mouth, which is blocked by a double bar.

OOROOME'YAH, or URUMEYAH: see OROOMIAH.

OOSPHERE, n. *ō'ŏ-sfēr* [Gr. *ōŏn*, an egg; *sphaira*, a globe]: the ovum or germ-cell in the lower plants.

OOSPORANGIA, n. plu. *ō-ŏs'pōr-ăn'jĭ-ă* [Gr. *ōŏn*, an egg; *spora*, seed; *anggos*, a vessel]: in *bot.*, sacs or spore-cases in some Algæ.

OOSPORE, n. *ō'ŏs-pōr*, OOSPORES, n. plu. *ō'ŏs-pōrz* [Gr. *ōŏn*, an egg; *spora*, seed]: in *bot.*, a fertilized spore in fungi; the oosphere after fertilization.

OOSTERHOUT, *ōs'tėr-howt:* Dutch town in N. Brabant, in a well-wooded fertile district. Nearly all the people are Rom. Catholics. Much business is done in grain and cattle, and there are tan-yards, beer-breweries, potteries, and brick-works. Pop. (1879) 9,853.

OOTACAMUND, *ô-tâ-kâ-mŭnd'* (*Utakamand*): chief town in the Neilgherry Hills, India, the great sanatorium of the Madras presidency, and the summer headquarters of the gov. of Madras. It stands on a plateau, in an amphitheatre surrounded by noble hills, and is 7,228 ft. above sea-level; the mean temperature being about 49°, maximum 76°, minimum 38°. The average rainfall is 45 inches. It is only about 350 m. from Madras, and is easy of access, as the railway now conveys the traveller to the foot of the Hills. There are thriving plantations of tea and coffee, and the cinchona or quinine plant. The first house was built 1821. Pop. about 10,000

OOTRUM, *ô'trŭm:* Indian fibre, from the stem of *Dœmia extensa*, plant of nat. order *Asclepiadaceæ*, abundant in many parts of Hindustan. The fibre is soft, white, silky, and strong, and is regarded as a promising substitute for flax.

OOZE, n. *ôz* [AS. *wos*, juice: Icel. *vas*, moisture: Norw. *vaasa*, to work in the wet and exposure: Gael. *uisge*, water]: soft mud or slime; a soft flow or issue; the liquid of a tan-vat: V. to flow or issue forth gently; to precolate, as a liquid, through pores or small openings. OO'ZING, imp.: N. that which oozes. OOZED, pp. *ôzd.* OOZY, a. *ô'zĭ*, slimy; containing soft mud. ATLANTIC OOZE, a deep-sea calcareous mud, composed chiefly of the microscopic shells or shields of foraminifera. Limestone is mostly of animal origin, though often much altered. Chalk is manifestly so. It often contains embedded in it, shells and other animal remains visible to the naked eye, showing it must have been deposited in the sea. The grains that form the mass of chalk, when examined under the microscope, are found to be the shells, broken or entire, of foraminifera. Myriads of these creatures people at this day the waters of the Atlantic near the surface, and as they die, their shells sink down in an incessant drizzle, adding year by year to the thickness of the gray *ooze* that covers great areas of the sea-bottom. Under the microscope, particles of this ooze exactly resemble particles of chalk. Mixed with the calcareous remains in the ooze there is a quantity of silica consisting of remains of organisms that secrete silicious coverings and skeletons. This accounts for the flint nodules in chalk, and the concretions of quartz in limestone.

OPACITY, n. *ō-păs'ĭ-tĭ* [F. *opacité*—from L. *opacĭtas*, shadiness—from *opācus*, dusky; dark: It. *opacita*]: want of transparency; darkness; gloom; obscurity. OPACOUS, a. *ō-pā'kŭs*, in *OE.*, dark; obscure

OPAH, *ō′pa*, or KING′-FISH (*Lampris guttatus* or *L. luna*): fish of the Dory (q.v.) family (*Zeïdæ*), common in northern seas, found in the Atlantic and Arctic oceans, and in the Pacific, on the coasts of China and Japan, though it is a deep-sea fish, and its special home is near Madeira and the Azores. It is of oval form, greatly compressed, with small thin scales, the mouth small and destitute of teeth, a single dorsal fin much elevated in front and extending almost to the tail. This fish attains large size, being sometimes five ft. long and 150 lbs. in weight. It is gorgeously colored, surpassing even the dolphins; the upper part of the back and sides rich green, reflecting purple and gold in different lights, the lower parts yellowish-green, round yellowish-white spots above and below the lateral line; all the fins bright vermilion. The flesh is much esteemed; it is red like salmon, and is said to resemble it in flavor.

OPAL, n. *ō′păl* [F. *opale*—from L. *opălus;* Gr. *opallĭŏs*, the opal: Pol. *palac*, to glow, to blaze: Serv. *opaliti*, to give fire]: kind of resinous quartz of milk-white, red-brown, green, and pearl-gray color. OPALESCE, v. *ō′păl-ĕs′*, to exhibit a play of colors like the opal. O′PALES′CING, imp. O′PALESCED′, pp. *-ĕst′*. O′PALES′CENT, a. *-ĕs′ĕnt*, milky and iridescent like the opal. O′PALES′CENCE, n. *-ĕns*, the reflection of a milky and iridescent light. OPALOID, a. *ō-pa-loyd* [Gr. *eidos*, appearance]: like opal; iridescent. OPALINE, a. *ō′pă-lĭn*, pertaining to the opal. OPALIZE, v. *ō′păl-īz*, to convert into a substance resembling opal. O′PALIZING, imp. O′PALIZED, pp. *-īzd:* ADJ. converted into a substance resembling opal.—*Opal* differs from quartz in containing 5 to 13 per cent. of water, its only other essential constituent being silica, though a little alumina, oxide of iron, etc., is often present. It is never found crystallized, and does not exhibit a crystalline structure like quartz. It has a conchoidal fracture, and is very easily broken. There are many varieties, which pass into one another, so that their precise limits cannot be defined, from which has arisen no little confusion of names. The finest kind is called *Precious O.* or *Noble O.*, and sometimes *Oriental Opal.* It is semi-transparent or translucent, usually of bluish or yellowish white color, yellow by transmitted light, and exhibits a beautiful play of brilliant colors, owing to minute fissures which refract the light. It is much valued for setting in rings, brooches, etc., and is polished with a convex surface, never cut into facets, both because of its brittleness, and because its play of colors is thus best exhibited. The ancients valued opals very highly. The Roman senator Nonius preferred exile to giving up an O. to Mark Antony. This O. was still to be seen in the days of Pliny, who ascribes to it a value equal to more than $500.000. The imperial cabinet of Vienna contains the most celebrated O. now known to exist. It is five inches by two inches and a half. Almost all the finest opals are brought from Kaschan in Hungary, where they are found scattered in a trachytic conglomerate. They are mostly very small, but even a very small O., if really beautiful, is worth $20 to $25; and the price increases very rapidly with increase of size. Precious O. is found also in Saxony, in S. America, etc. When the colors are not equally diffused, but in detached spots, jewellers call it *Harlequin Opal.* There is a dark or blackish variety, apparently tinged by oxide of iron, which occasionally exhibits very beautiful reflections, and is then much prized. *Girasol* (q.v.) and *Cacholong* (q.v.) are varieties of opal. What lapidaries call *Prime d'Opal* is clay-porphyry, or other stone containing many small grains of opal. It is cut into slabs, and made into boxes and other ornamental articles; the stone which contains the opals being often artifically blackened by boiling in oil, and afterward exposing to a moderate heat.—*Common O.* is semi-transparent, white, yellow, green, red, or brown, and does not exhibit any play of colors. It is not a rare mineral, and is found chiefly in clay-porphyry. *Semi-opal* is more opaque. *Wood O.* is a petrifaction, and exhibits the form and structure of wood, the place of which has been taken by the siliceous mineral. *Hyalite* and *Menilite* are varieties of opal.

OPAQUE, a. *ō-pāk'* [F. *opaque*—from L. *opācus*, dark]: not transparent; obscure; dark. OPAQUE'LY, ad. *-lĭ.* OPAQUE'NESS, n. *-nĕs*, the want of transparency.

OPE, *ōp:* poetic for *open.*

OPEIDOSCOPE, *ō-pī'dō-skōp* [Gr. *ops*, voice, word; *eidos*, form; *skopein*, see]: instrument for illustrating sound by means of light. It may be regarded as an inchoate Photophone (q.v.); the rays from the vibrating mirror are in the O. thrown on a screen.

OPELIKA, *ŏp-ė-lī'ka:* city, cap. of Lee co., Ala., at the junction of the Western Alabama, the Columbus and Western, and the East Alabama railroads; 28 m. from Columbus, Ga., 113 m. from Atlanta. It is in a grain and cotton growing country, and has manufactures of flour and cottonseed oil; also knitting-mills, marble-works, and artificial ice-factory. There are 10 churches (Presb., Prot. Episc., Bapt., Primitive Bapt., Meth. Episc. South, 3 colored Meth. Episc., and 2 colored Bapt.); 1 graded school, 1 chartered seminary, 2 private schools for white children, and 4 colored schools; 1 national bank (cap. $50,000), and 1 state bank (cap. $50,000), and 1 semi-weekly and 1 weekly newspaper. Pop. (1890) corporate limits 3,674, with subsurbs 6,671.

OPELOUSAS, *ŏp-ė-lô'sas:* village, cap. St. Landry parish, La. It is on the Southern Pacific railroad, about 45 m. w. by n. of Baton Rouge, 160 m. from New Orleans. It has five churches, a convent and an acad.; and two weekly newspapers, one of which is printed in both English and French. It is in the midst of a productive agricultural region, and is an important point of shipment of cotton and rice. Pop. (1870) 1,546; (1880) 1,676.

OPEN, a. *ō'pn* [Ger. *offen;* Icel. *opinn;* AS. *yppe*, open: Ger. *öffnen;* Icel. *opna;* L. *aperirĕ*, to open]: not shut or closed; expanded; not covered; clear; unobstructed; free to all; artless; frank; sincere; exposed to view; liable; not frosty, applied to the weather: V. to unlock: to unclose; to commence firing guns; to unfold; to break or split; to disclose; to explain or interpret; to begin; to bark, as dogs in hunting; to clear. **OPENING**, imp. *ō'pn-ĭng:* N. an aperture; a hole; a place admitting entrance; beginning; first appearance; opportunity, as a good *opening* presents itself. **OPENED**, pp. *ō'pnd*. **OPENINGS**, n. plu. *ō'pn-ĭngz*, piercings; holes; unfilled parts of a wall. **OPENER**, n. *ō'pn-ėr*, one who opens; that which opens. **OPENLY**, ad. *ō'pn-lĭ*, in public; not secretly. **OPENNESS**, n. *ō'pn-nĕs*, the quality or condition of being open; freedom from secrecy or obscurity; plainness; mildness, as applied to weather. **OPEN-COAST**, in *mining*, the method of working a vein when the ore oppears at the outcrop, and can be obtained without sinking a deep shaft. **OPEN-EYED**, a. vigilant; watchful. **OPEN-HANDED**, a. liberal; generous. **OPEN-HEARTED**, a. frank; generous. **OPEN-HEARTEDNESS**, n. frankness: sincerity; generosity. **OPEN-MOUTHED**, a. greedy; clamorous. **OPENWORK**, *ō'pn-wėrk*, in *fort.*, a work not protected at the gorge: in *mining*, work done in the open air, not underground. **TO OPEN UP**, to lay open; to disclose; to discover (*up* may often well be omitted). **OPENING OF THE TRENCHES**, the commencement of the works of attack against a fortress; equivalent to the common expression 'breaking ground.' **THE OPEN**, the open country.—SYN. of 'open, a.': ingenuous; candid; unclouded; uncovered; unclosed; exposed; unprotected; apparent; plain; obvious; public; unreserved; evident; clear; undissembled; hearty; cordial; warm; attentive;—of 'open, v.': to unloose; show; discover; divide; break; explain; exhibit; interpret; reveal; commence.

OPEN-BILL (***Anastomus***): genus of birds of Heron family (***Ardeidæ***), natives of E. Indies and of Africa, remarkable for the structure of the bill, the mandibles being in contact only at the base and tip, with a wide interval between their edges in the middle. They frequent the sea-coast and rivers, and prey on fish and reptiles. One species is well known in India as the Coromandel Heron.

OPEN DOORS, LETTERS OF, in Scotch Law: writ authorizing a messenger to poind or seize goods deposited on lockfast-places, and to break open the locked doors in order to effect the seizure: see HOUSE.

OPEN-HEARTH FURNACE, *ō'pn-hârth fėr'nās:* form of reverberatory furnace used in steel-making: see IRON.

OPEN-SESAME, *ō'pn-sĕs'â-mē:* magic formula by which in the *Thousand and One Nights* tale of the *Forty Thieves*, the door of the robbers' cave was opened; hence, by metonymy, any magic formula supposed to have a like effect.

OPERA, n. *ŏp'ėr-a* or *ŏp'ra* [F. *opéra*—from It. *opera*—from L. *opĕra*, work, labor]: a dramatic composition set to music, and sung and acted on the stage with instrumental accompaniments. **OPERATIC**, a. *ŏp'ĕ-răt'ĭk*, or **OP'ERAT'ICAL**, a. *-răt'ĭ-kăl*, pertaining to the opera. **OP'ERAT'ICALLY**, ad. *-lĭ*. **OPERA-DANCER**, a girl who dances in an opera or ballet; a ballet-girl, or a male dancer. **OPERA-GLASS**, a small telescope, usually binocular, for viewing persons and objects more distinctly at any place of public amusement (see below). **OPERA-HOUSE**, a building in which operas are performed.—*Opera* is a musical drama, in which music forms an essential part, and not a mere accessory. As in the higher drama, poetry supersedes the prose of ordinary life, so in the O., with perhaps as great artistic right, the language of music is introduced at a considerable sacrifice of probability. The libretto or words are, in the modern O., a peg on which to hang the music, rather than the music an accessory to the written drama. The component parts of an O. are recitatives, duets, trios, quartets, choruses, and finales, accompanied throughout by an orchestra, and the whole is preceded by an instrumental Overture (q.v.). Recitative is declamation, which, in its succession of musical sounds and rhythm, strives to assimilate itself as much as possible to the accents of speech, and therefore does not entirely conform to musical rhythm. The accessories of scenic representation also are present, and a Ballet (q.v.) is frequently introduced. In some of the German operas, and in the French *opéra comique*, spoken dialogue without music takes the place of recitative. Among the varieties of the O. enumerated are the grand O., or *opera seria*, of dignified character; the romantic O., an admixture of the grave and lively; the comic O., or *opera buffa;* and many intermediate varieties.

The idea of the O. may have arisen partly from the Greek drama, which possessed, to a considerable extent, the operatic character: the choral parts were sung, and the dialogue was delivered in a sustained key, probably resembling operatic recitative more than ordinary speech. The earliest extant example of any composition resembling the lyric drama of the moderns is Adam de la Hale's comic O. of *Li gieus (le jeu) de Robin et de Marian*, composed in the 13th c., the music of which is wonderful for its date. The next appearance of anything like O. is in the 16th c., when various musical dramas were composed in the madrigalesque style. An opera composed by Zarlino is said to have been performed at Venice, when Henry III. passed through that city on his way from Poland to France. About the same time, a pastoral called *Dafne*, written by the poet Rinucci, was set to music by Peri; and the same poet and musician conjointly produced the lyric tragedy *La Morte di Euridice*, which was represented at the theatre of Florence 1600. Claudio Monteverde, one of a soc. of amateurs, known as the 'Florentine Academy,' who devoted themselves avowedly to the study and revival of Greek music, soon afterward produced his *Orfeo*, a 'favola di musica,' in whose performance an orchestra of no fewer than 36 performers was called into requisition, most of the instruments being, however, used only in twos or threes, and never more than ten at a time. From these beginnings, the O., advanced into one of the permanent institutions of Italy—a development of music at first strongly opposed in character and style to the music of the church. With the progress of music, and the perfecting of the musical instruments comprised in the orchestra, the lyric drama began, toward the middle of the 18th c., to approach its present character. Of the innumerable Italian operas of the 18th c., only Cimarosa's *Matrimonio Segreto* retains its place on the stage. Cherubini, first of the more modern school, after producing *Quinto Fabio* at Milan, became naturalized in France: Rossini, who succeeded him in Italy, is the greatest name in the Italian opera. Nothing can exceed the deliciously fresh character of the best known operas of this truly great musician, *Il Barbiere di Siviglia*, *Otello*, *La Gazza Ladra*, *Semiramide*, and *Guillaume Tell*. Next to them rank the equally well-known works of Bellini, *Norma*, *La Sonnambula*, and *I Puritani*; *Lucia di Lammermoor*, *Lucrezia Borgia*, and *L'Elisir d'Amore*, the three *chefs-d'œuvre* of Donizetti, alone rivalling them in public estimation. A newer school of O. has recently sprung up in Italy, more grand though less fresh, of which the chief master is Verdi, whose *Ernani*, *Nabuchodonosor*, *I Lombardi*, *Otello*, *Rigoletto*, *Il Trovatore*, *La Traviata*, and others have attained immense popularity in Italy, and have held the stage wherever the Italian O. has been naturalized.

From Italy the O. was introduced into Germany, where, more scientific and less sensuous than in Italy, it flourished in opposition to national as well as ecclesiastical music. Germany divides with Italy the honor of perfecting orchestral music and the O. Glück, educated in Italy, produced his *Orfeo* in Vienna, and then went to Paris, where the French adopted him as the English adopted Handel. Mozart was the first composer of operas for the modern orchestra; *Idomeneo*, *Il Seraglio*, *Le Nozze di Figaro*, *Don Giovanni*, and *Zauberflöte* are his principal operatic works, unsurpassed by anything that has succeeded them. The most important German operas composed since their date are *Fidelio* by Beethoven; *Der Freischütz*, *Euryanthe*, and *Oberon* by Weber; *Faust* by Spohr; and the gorgeous operas of Meyerbeer, *Robert le Diable*, *Les Huguenots*, and *Le Prophète*, and *L'Étoile du Nord*. *Les Huguenots*, notwithstanding its involving enormous difficulties in representation, keeps its place in every operatic theatre in Europe, Richard Wagner (q.v.), chief exponent of a more recent school, generally known as that of the 'music of the future,' has by his *Tannhäuser*, *Lohengrin*, *Parsifal*, and other operas, introduced a new epoch in lyric drama, subordinating the instrumental music to the poetry, and dispensing with the set parts rigorously required in the old operas. The O. of the future, whether or not following Wagner's lead, will not escape a decided tinge from his influence. (See GLUCK: WAGNER, RICHARD: ETC.).

In France, the earliest operatic representation on record was in 1582. About 1669, the Abbot Perrin obtained from Louis XIV. the privilege of establishing an O. in the French language at Paris, and 1672 the privilege was transferred to Lulli, who may be considered the founder of the French lyrical drama. Lulli's popularity continued during a long period, and ended at the rise of the German Glück, who, naturalized in Paris, produced there his *Iphigènie in Aulide* and *Alceste.* It is greatly through Glück's influence that the modern French O. has become what it is, a composite work combining French, German, and Italian elements. Its best known productions include Méhul's *Joseph,* Halévy's *Juive,* Auber's, *Masaniello, Fra Diavolo,* and *Diamans de la Couronne,* and Gounod's *Faust. Polyeucte,* and *Tribut de Zamora.* The Italian O., introduced in Paris, 1646 by Cardinal Mazarin, and superseded 1670, was revived in the beginning of the 19th c., and has since flourished side by side with the national O. of France.

The possibility of a national English O. seems to have been shown first by Purcell, who, through Humphreys, had learned much from Lulli. His music to Dryden's *King Arthur* is very beautiful, though kept throughout subordinate to the business of the drama. *The Beggar's Opera,* as set to music by Dr. Pepusch, was a selection of the airs most popular at the time, It has retained its place on the stage, as has Dr. Arne's *Artaxerxes,* a translation from Metastasio adapted to music rich in melody. The importation of the Italian O. put a stop, for a time at least, to the further development of an O. in England. In 1706, *Arsinoë,* with English words adapted to Italian airs, was performed at Drury Lane. In 1710, *Almahide,* wholly in Italian, was performed exclusively by Italian singers at the Haymarket Theatre; and a succession of attempts of the kind ended in the permanent establishment of the Italian opera. The arrival of Handel in England decided the future progress of the opera. That great master was during the greater part of his life an opera composer and opera manager. He composed for the London stage no fewer than 44 operas, now forgotten, German, Italian, and English. These were of course not the complex compositions of a later period, which could not have been performed in the then imperfect state of orchestral instruments. A recitative was set to music nearly as fast as the composer could put notes on paper, and the songs were accompanied in general by only one violin and bass, the composer sitting at the harpsichord, and supplying what was wanting. From Handel's time onward, the O. flourished as an exotic in Britain, the singers being foreign, and the works performed being either Italian or occasionally German or French. Attempts crowned with some measure of success have latterly been made in England, to establish an O. of national character. Balfe's *Bohemian Girl* and *Rose of Castile* have, with other operas by Balfe, Wallace, and Macfarren, attained some popularity. Somewhat similar to the English hopes and efforts have been those in the United States to originate a national O. expressive of the national spirit. No signs have appeared of any immediate success in this direction: the O. music of this country will probably long continue to be imported; but it is safe to predict that the importation will be of the best that the world of dramatic music can supply. See Hogarth's *Memoirs of the O.* (1851); S. Edward's *History of the O.* (1862); Grove's *Dictionary of Music.*

OPERA-GLASS: double telescope, used for looking at objects that require to be clearly seen rather than greatly magnified, such as adjoining scenery and buildings, the performers of a theatre or opera, etc. It is from its use at an opera that it derives its name. The O.-G. is short and light, and can be easily managed with one hand. Its small magnifying power (usually 2 to 3), and the large amount of light admitted by the ample object-glass, enable it to present a bright and pleasing picture, so that the eye is not strained to make out details, as in telescopes of greater power, which generally show a picture highly magnified but faint. It allows the use of both eyes, which gives the spectator the double advantage, not possessed by single telescopes, of not needing to keep one eye shut—an unnatural way of looking; and of seeing things stand out stereoscopically as in ordinary vision.

The O.-G. is the same in principle as the telescope invented by Galileo. It consists of two lenses, an object lens, and an eye-lens. The object-lens is convex, and the eye-lens concave. They are placed nearly at the distance of the difference of their focal lengths from one another. Fig. 1 represents the action of the telescope; *o* is the object-lens, and *e* the eye-lens, and *oe* is the axis of the instrument. The object-lens would form an image, *cab*, of the object looked at at or near its focus, but the eye-lens intervening, converts the light converging to *cab* to light diverging apparently from an object in front, CAB. To show more clearly the changes which the light undergoes, the course of a pencil of rays proceeding from the top of an object is traced. The ray proceeding from the top of the object to the centre of the lens, *o*, makes an angle, *ro*A, with the axis. This is the same as the angle *aob;* and either of these angles gives half the angle under which the object is seen to the unaided eye. The three extreme rays, *r, r, r,* of the pencil appear in the figure nearly parallel,

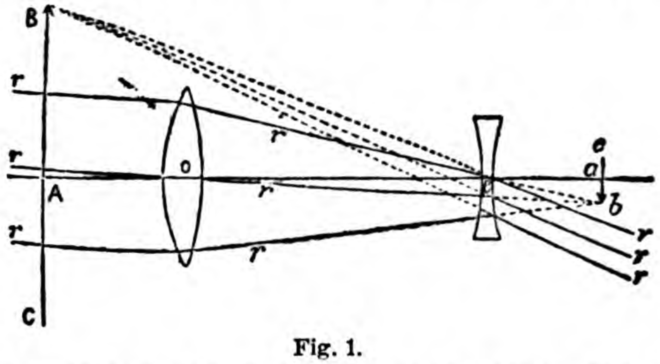


Fig. 1.

though they come from a point: the object is at a considerable distance from the object-glass or eye, so that it is not possible in so limited a figure to show their divergence. After passing through the object-lens, the three rays proceed to the point *b*, in the image which the object-lens would form at *cab*, if no eye-lens were there. This image, as shown in the figure, is inverted, and would be seen as such if the eye were placed about ten inches (the distance of distinct vision) behind it. The three rays in question do not reach the point *b* in consequence of the eye-lens intervening, and their course onward to that point, after passing the eye-lens, is shown by dotted lines. The actual course, after passing the second lens, is shown again by the full lines, *r*, *r*, *r*, which to the eye placed immediately behind the eye-lens appear to proceed from the point B in front. As the light comes from B in the same direction as it comes from the actual point in the object, the image is erect. What holds for the point B, holds for every point in the image and object. To find the magnifying power, it is necessary to join B*e* and C*e*, and produce the lines thus formed to *b* and *c*. As the eye is placed immediately behind the eye-lens, the angle under which the magnified object is seen is the angle B*e*C, which is equal to *ceb*. Now, the angle under which the object itself is seen at *o* or at *e*—for the slight difference has no effect at the distance at which objects require to be seen by a telescope—is twice the Angle *ro*A, or which is the same thing, the angle *cob*. The ratio of the angle *ceb* to the angle *cob*, which is the magnifying power, is easily seen to be the same as that of the line *oa* to the line *ae*. But *oa* is the focal length of the object-glass, and *ae* is the focal length of the eye-glass, so that the magnifying power of the instrument is the number of times the focal length of the eye-glass is contained in that of the object-glass. The longer, therefore, the focal length of the object-lens, or the shorter the focal length of the eye-lens, the greater the magnifying power. This may be practically expressed thus: the flatter the object-lens, and the hollower the eye-lens, the more are objects magnified by the glass. The magnifying power may be found with sufficient accuracy by looking at an object with one eye through the tube and the other eye unaided, and so handling the glass that the magnified image seen by the one eye is superposed on the object seen by the naked eye, when a comparison of their relative sizes can be easily made. For great magnification, the instrument requires to be greatly lengthened—a condition inconsistent with its use as an opera-glass. In addition, a high magnifying power is attended with the disadvantage that the field of view, or amount of object or objects seen, becomes too limited. On screwing out the instrument, it will be seen that objects increase in size as the instrument is lengthened, but that the picture becomes more and more limited, showing that a large power and a large field are incompatible. The O.-G. need not be set to the same precise point as is necessary with ordinary terrestrial telescopes, as the lengthening or shortening of the instrument does not produce so decided an effect on the divergence of the light; the change of divergence, caused by screwing the O.-G. out or in, is so slight as not much to overstep the power of adjustment of the eye, so that an object does not lose all its distinctness at any point within the range of the instrument. There is, however, a particular point at which an object at a certain distance is best seen.

Fig. 2 gives a section of the O.-G. The two telescopes are identical in construction, and are placed parallel. The blending of the two images is easily effected by the eyes, as in ordinary vision. Paris has nearly a monopoly of the manufacture of opera-glasses. The cheapest consist of single lenses; those of the better class have compound achromatic lens. A usual construction for a medium price is to have an achromatic object-lens, consisting of two lenses and a single eye-lens. In the finest class of opera-glasses, called *field-glasses*, both eye-lenses and object-lenses are achromatic. Plössl's celebrated field-glasses (Ger. *Feldstecher*) have 12 lenses, each object-lens and eye-lens being composed of three separate lenses.

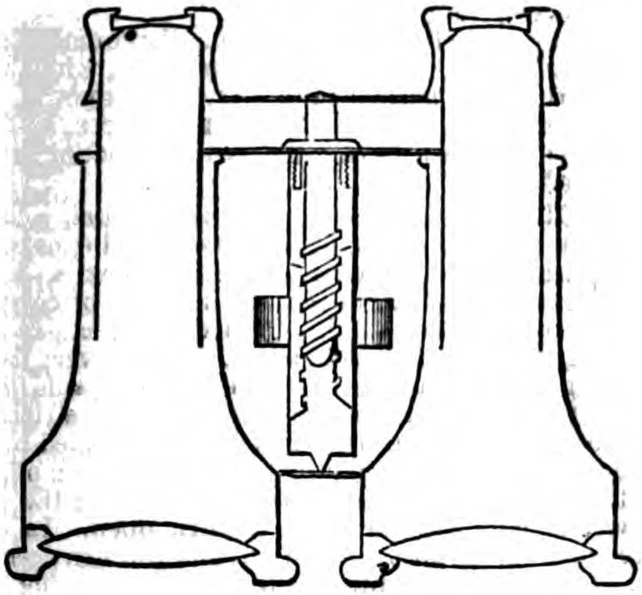


Fig. 2.

OP'ERA-HAT, n.: a folding hat of felt, silk, or fur.

OPERAMETER, n. *ŏp'ĕr-ăm'ĕ-tĕr* [L. *opĕra*, work; Gr. *metron*, measure]: an instrument which indicates the number of revolutions made by a wheel or shaft; a machine for measuring work done, as of cloth.

OPERANT, a. *ŏp'ĕr-ănt* [L. *op'erans* or *operan'tem*, working—from *opus*, work]: in *OE.*, having power to produce any effect. OPERANCY, n. *ŏp'ĕr-an-sĭ:* the act or state of operating; operation.

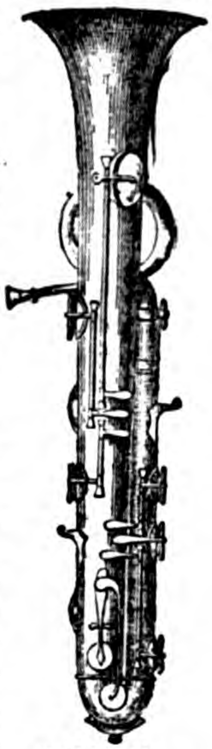
OPERATE, v. *ŏp'ĕr-āt* [L. *operātus*, worked, labored—from *opus* and *opera*, work: It. *operare:* F. *opérer*]: to exert power or strength, either physical or mechanical: to produce any effect; to produce by agency: to cut or open a part of the body with a view to healing, as a surgeon. OP'ERATING, imp. OP'ERATED, pp. OP'ERATOR, n. *-ā-tėr*, one who operates; in *surg.*, the skilled person who does some remedial act upon the human body by cutting with an instrument, or otherwise. OP'ERA'TION, n. *-ā'shŭn* [F.—L.]: the act or process of operating; something to be done; agency; process; influence; action; effect; in *surg.*, any action done by a qualified person upon the human body, with the hand or by means of an instrument, with a view to heal or bring to a normal state. OP'ERA'TIONS, n. plu. *-shŭnz*, movements, as of an army. OP'ERATIVE, n. *-tĭv*, a skilled workman: ADJ. having the power of acting; exerting force; effective.

OPERCULAR, a. *ō-pėr'kū-lėr* [L. *oper'culum*, a lid or cover—from *operĭō*, I cover over]: having a lid or cover; of the nature of a lid or cover. OPER'CULATE, a. *-lāt*, or OPER'CULA'TED, a. *-lā'tĕd*, in *bot.*, having a lid or cover, as a capsule; opening by a lid. OPER'CULUM, n. *-kū-lŭm*, OPER'CULA, plu. *-kū-lă*, in *bot.*, a cap, lid, or cover; the lid or covering of the mouth of the urn or capsule (*theca*) which contains the spores of mosses. Before the ripening of the spores, the operculum is generally concealed by the *calyptra;* but after the calyptra has been thrown off, the operculum itself also generally falls off, leaving the peristome visible, and the mouth of the urn open. In some cases the operculum does not fall off, and the urn opens by valves. In *conch.*, operculum is the lid or covering with which certain mollusks, e.g., the periwinkle, close the aperture of their shells when they withdraw within them. It is attached to the back of the foot of the mollusk. In some it is calcareous, forming a shelly plate; in some it is horny; while gasteropods very nearly allied to those which possess it, are destitute of it altogether. The operculum increases in various ways, so as to present in different genera great diversity of structure, concentric, spiral, unguiculate, etc. In *ichth.*, operculum is the gill-cover, or bony flap covering and protecting the gills in fishes. OPER'CULA'TA, n. plu. those gasteropods whose shell is closed by an operculum or horny valve. OPERCULIFORM, a. *ō'pėr-kū'lĭ-fŭwrm* [L. *forma*, shape]: formed as a lid or cover.

OPERETTA, n. *ŏp-ėr-ĕt'ta* [It., dim. of *opera*]: in *mus.*, a short opera, or musical drama of a light character.

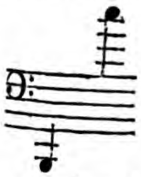
OPEROSE, a. *ŏp'ĕr-ōs* [L. *operōsus*, industrious, laborious—from *opĕră*, work, labor: It. *operoso*]: attended with much labor; tedious. OP'EROSELY, ad. *-lĭ*. OP'EROSE'NESS, n. *-nĕs*, the state of being laborious.

OPHICEPHALUS, *ŏf-ĭ-sĕf'a-lŭs:* genus of fishes, of family *Anabasidæ* (q.v.), sometimes regarded as constituting a distinct family *Ophicephalidæ*, because there is a mere cavity for retaining water to supply the gills, and no pharyngeal laminæ, and because of the long eel-like form and the flattened head covered with large scales. Some of them are common in fresh waters of the E. Indies, are often found among wet grass, often travel from one pool to another, and are capable of subsisting for a long time in half-dried mud, descending into it when the pools dry up. The CORA-MOTA or GACHUA of India (*O. gachua*) is much used for food by the natives, though generally rejected by Europeans on account of its very snake-like appearance. It is very tenacious of life, and is not only brought to the Indian markets alive, but is cut to pieces while still living for the convenience of buyers.



Ophicleide.

OPHICLEIDE, n. *ŏf'ĭ-klīd* [Gr. *ophis*, a serpent; *kleis* or *kleida*, a key: F. *ophicléide*]: largest keyed musical wind-instrument of brass or copper, invented to supersede the Serpent (q.v.) in the orchestra and military bands. It consists of a conical tube, terminating in a bell like that of the horn, with a mouth-piece similar to that of the serpent, and ten ventages or holes, all stopped by keys like those of the bassoon, but of larger size. Ophicleides are of two kinds, the bass and the alto. The bass O. offers great resources for maintaining the low part of masses of harmony. Music for it is written in the bass clef, and the compass of the instrument is from B, the third space below the bass staff, to C, the fifth added space above it, including all the intervening chromatic intervals. The alto O. is an instrument of much inferior quality, and less used. Its compass also is three octaves and one note. The music for it is written in the treble cleff, and an octave higher than it is played. Double bass or monster ophicleides have sometimes been used in large orchestras, but the amount of breath required to play them has prevented their coming into general use.



OPHIDIAN, a. *ŏf-ĭd'ĭ-ăn* [Gr. *ophĭdĭŏn*, a small serpent —from *ophis*, a serpent]: belonging to the serpent order of reptiles, called OPHID'IA, n. plu., or OPHID'IANS, n. plu. *-ănz* (see SERPENTS). OPHID'ION, n. *-ŏn*, an eel-shaped fish, found in the Mediterranean. OPHID'IOUS, a. *-ŭs*, snake-like.

OPHIOBATRACHIA, n. plu. *ŏf'ĭ-ō-băt-răk'ĭ-ă* [Gr. *ophis*, a serpent—gen. *ophios; batrăchos*, a frog]: applied sometimes to the order of snake-like Amphibians, as the *Cæciliæ*.

OPHIOGLOSSEÆ, *ŏf-ĭ-o-glŏs'ē-ē:* suborder of *Filices* or Ferns (q.v.), consisting of a few rather elegant little plants with an erect or pendulous stem, which has a cavity instead of pith, leaves with netted veins, and the spore-cases (*thecæ*) collected into a spike formed at the edges of an altered leaf, 2-valved, and without trace of an elastic ring. They are found in warm and temperate countries, but abound most in the islands of tropical Asia. Several species are European. The Common Adder's-tongue (*Ophioglossum vulgatum*), was formerly supposed to have magical virtues, and was used also as a vulnerary, though it seems to possess only a mucilaginous quality.

Adder's-Tongue (*Ophioglossum vulgatum*).

OPHIOLOGY, n. *ŏf'ĭ-ŏl'ŏ-jĭ* [Gr. *ophis*, a serpent; *logos*, discourse]: that branch of natural history which treats of serpents. OPHIOLOGIC, a. *ŏf'ĭ-ŏ-lŏj'ĭk*, or OPH'IOLOG'ICAL, a. *-ĭ-kăl*, pertaining to. OPH'IOL'OGIST, n. *-jĭst*, one versed in the natural history of serpents.

OPHIOMANCY, n. *ŏf'ĭ-ŏ-măn'sĭ* [Gr. *ophis*, a serpent; *mantei'a*, divination]: divination by serpents.

OPHIOMORPHA, n. plu. *ŏf'ĭ-ō-mŏr'fă* [Gr. *ophis*, a serpent; *morphē*, shape]: the order of Amphibia which includes the *Cæciliæ*. OPHIOMOR'PHOUS, a. *-mŏr'fŭs*, having the form of a serpent; snake-shaped.

OPHIOPHAGOUS, a. *ŏf'ĭ-ŏf'ă-gŭs* [Gr. *ophis*, a serpent; *phagein*, to eat]: eating or feeding on serpents.

O'PHIR, *ō'fėr:* region frequently mentioned in the Old Test., and from which the ships of Solomon, fitted out in the harbors of Edom, brought gold, precious stones, sandal-wood, etc. The voyage occupied three years. Where Ophir was situated, has been a disputed question. It was probably in one of these three countries: on the east coast of Africa about Sofala, or in Arabia, or in India. Huet, Bruce (the traveller), the historian Robertson, M. Quatremère, etc., are in favor of Africa; Michaelis, Niebühr (the traveller), Gosellin, Vincent, Winer, Fürst, Knobel, Forster, Crawfurd, and Kalisch, of Arabia; Vitringa, Reland, Lassen, Ritter, Bertheau, and Ewald, of India. Josephus, however, it should be said, placed O. in the peninsula of Malacca, and his very respectable opinion has been adopted by Sir J. Emerson Tennent in his work on Ceylon. For a complete discussion of the point, see Karl Ritter's *Erdkunde* (vol. xiv. 1848), 80 octavo pages of which are devoted to Ophir. According to Ritter, who accepts the view of Lassen, O. was situated at the mouth of the Indus. To each of the three sites there are some objections; but s.e. Arabia probably presents the fewest; and that region certainly had for its inhabitants in ancient times the descendants of the son of Joktan who was named Ophir (see Gen. x. 29).

O′PHIR, called by the Malays, *Gunong Pasaman:* volcanic mountain in the highlands of Padang, island of Sumatra, 0° 4′ 58″ n. lat., and 99° 55′ e. long. The e. peak, Telaman, is 9,939 ft. above the sea; the w. peak is called Pasaman. The numerous inhabitants have cleared off forest and brought under cultivation large tracts of land on the slopes of O., and its base is studded with villages. The O. districts are most beautiful, and the lofty waterfalls, contrasting with the bright-green foliage of the mountain, highly picturesque.

OPHISU′RUS: see SNAKE-EEL.

OPHITE, n. *ō′fīt*, or OPHIOLITE, n. *ŏf-ī′ō-līt* [Gr. *ophis*, a serpent; *lithos*, a stone]: green porphyry or serpentine.

OPHITES, n. plu. *ō′fīts* [Gr. *ophitai*, serpent-brethren, from *ophis*, serpent]: sect of Gnostics (q.v.) in the 2d c., who while they shared the general belief of dualism, the conflict of matter and spirit, the emanations, the Demiurgos, and other notions common to the many subdivisions of that extraordinary school, were distinguished from all by their peculiar doctrine and worship connected with their *ophis* or serpent. The O., like most other Gnostics, regarded the Demiurgos, or the Jehovah of the Old Testament, with great abhorrence, but they pursued this notion into a very curious development. Regarding the emancipation of man from the power and control of the Demiurgos as a most important end, they considered the serpent who tempted Eve, and introduced into the world 'knowledge' and revolt against Jehovah, to have been the great benefactor of the human race. Hence their worship of the serpent as the Savior and the Christ. They attempted to engraft 'Ophism' on Christianity, and sought to impart to the Christian Eucharist an Ophite character, by causing the bread designed for the Eucharistic sacrifice *to be licked by a serpent*, which was kept in a cave for the purpose, and which the communicants kissed after receiving the Eucharist (*Epiph. Hor.* 37, s. 5). Our information, however, regarding them is very meagre, and comes chiefly from antagonistic sources. The O. originated in Egypt, probably from some relation to the Egyptian serpent-worship, and spread thence into Syria and Asia Minor. Offshoots of this sect are the Cainites: see CAIN: SETHITES.

OPHIUCHUS, n. *ŏf′ĭ-ū′kŭs* [Gr. *ophis*, a serpent; *echein*, to hold]: the serpent-bearer, one of the northern constellations, represented by a man holding a serpent.

OPHIUROIDEA, n. plu. *ŏf′ĭ-ū-roy′dē-ă* [Gr. *ophis*, a snake; *oura*, a tail; *eidos*, appearance]: the Brittle Starfishes (q.v.), a class of *Echinodermata* (q.v.): see also ZOOLOGY.

OPHTHALMIA.

OPHTHALMIA, n. *ŏf-thăl′mĭ-ă*, or **Ophthal′my**, n. *-mĭ* [Gr. *ophthalmos*, the eye]: inflammation of the eye. **Ophthal′mic**, a. *-mĭk*, pertaining to the eye. **Ophthal′modyn′ia**, n. *-dĭn′ĭ-ă* [Gr. *odunē*, pain]. violent pain in the eye.—*Ophthalmia* was originally and is still sometimes used to denote inflammation of the eye *generally;* but it is now usually restricted to inflammatory affections of the mucuous coat of the eye, termed the *conjunctiva.*

Before these are considered, two other diseases, still sometimes described under this name, must be noticed: (1) *Ophthalmia tarsi, tinea tarsi* or *blepharitis*, inflammation of the edges of the lids, usually chronic and very often neglected. It is a serious condition, however, as it is apt to lead, if unchecked, to loss of eyelashes, and 'blear eyes.' (2) *Sympathetic ophthalmia*, very insidious and dangerous disease, apt to occur in one eye when the other has been wounded or is the seat of certain forms of disease. The only preventive is removal of the offending eyeball, and this must be resorted to at the first sign that sympathetic O. threatens the other; for, when once established, it is peculiarly intractable, and may even lead to total destruction of the eye attacked by it.

The most important forms of O. in the present restricted sense of the word are:

1. *Catarrhal Ophthalmia.*—Its leading symptoms are redness of the surface of the eye (the redness being superficial, of bright scarlet, and usually diffused in patches), sensations of uneasiness, stiffness and dryness, with slight pain, especially when the eye is exposed to the light; an increased discharge, not of tears, except at the beginning of the attack, but of mucus, which at first is thin, but soon becomes opaque, yellow, and thicker; pus (or matter, as it is popularly termed) being seen at the corner of the eye, or between the eyelashes along the edges of the lids, which it glues together during the night. The disease results in most cases from exposure to cold and damp, and is very apt to be excited by exposure to a draught of air, especially during sleep. It is popularly known as a ***cold*** or a *blight* in the eye. The usual domestic treatment by the application of wet cloths, bread poultices, etc., is most mischievous, and cannot too strongly be condemned. This disease is generally easily checked by the application of a mild astringent wash (alum 3 grains, or boracic acid 10 grains, to the ounce of water), to the eye 3 or 4 times daily; and of some ointment to the edges of the lids, to prevent adhesion during sleep. If it become chronic, it is best treated by touching the conjunctiva of the lids every second or third day with a solution of nitrate of silver, 10 or 15 grains to the ounce of water.

2. *Purulent Ophthalmia* is often indistinguishable at its onset from catarrhal O., but soon becomes much more severe, and is extremely apt to lead to ulceration or complete destruction of the cornea, and consequent great impairment or entire loss of vision. Three varieties may be distinguished, which differ, however, more in their causation, mode of occurrence, and severity, than in their es-

sential systems: (*a*) *purulent ophthalmia of adults*, or Egyptian O.; (*b*) *purulent ophthalmia of newly-born children;* (*c*) *gonorrheal ophthalmia.* One description will suffice for all the forms. The conjunctiva rapidly becomes intensely red, and soon appears raised from the sclerotic by the effusion of serum between them, projecting around the cornea, which remains buried, as it were, in a pit. Similar effusion takes place beneath the mucous membrane lining the eyelids, causing them to project forward in large livid convex masses, which often entirely conceal the globe of the eye. These symptoms are accompanied by severe burning pain, great headache, fever, and prostration. The disease may be arrested at this stage, and end in complete recovery, or may involve the cornea, and lead to permanent injury, or loss of the eye. (*a*) Egyptian O. got that name because it was imported into England from Egypt (where, as in other hot countries, it is very common) by British troops in the beginning of the 19th c. It is not frequent in Britain or N. America. (*b*) O. of newly-born children usually begins about the third day after birth. It is very common, but very often neglected; and, though much more amenable to treatment than the other forms, is the cause of about one-third of the cases of blindness occurring in Europe. (*c*) Gonorrheal O. is caused by the application of discharge from a gonorrhea to the eye, and is hence most frequent in persons suffering from that disease. It is the most severe form of purulent ophthalmia.—*Treatment:* All the forms are very dangerous to the sight, and medical advice should be obtained at once on the slightest suspicion of the presence of this disease. All are highly contagious; cleanliness must be scrupulously maintained, and the greatest care taken not to let the discharge from an affected eye come in contact with a healthy one.

3. *Diphtheritic Ophthalmia* is even more dangerous and destructive than purulent ophthalmia, which it much resembles. It differs in that the discharge adheres to the conjunctiva in the form of a membrane.

4. *Pustular* or *Phlyctenular Ophthalmia*, often called *strumous ophthalmia*, is very frequent, especially in children, and is usually associated with weak health, in which case it is very troublesome, and apt to return. It is, however, seldom serious. It is characterized by the appearance at or near the margin of the cornea of small reddish or yellow elevations, with reddening of the conjunctiva, usually in limited bands directed inward toward them. In troublesome cases, there is great irritability of the eyes, and sensitiveness to light.—*Treatment:* The application of mercury, in the form either of calomel or of a weak mercurial ointment, is the treatment most generally useful. But attention must always be given to the general health, by means of fresh air, good food, cleanliness, and administration of strengthening medicines, especially cod-liver oil and iodide of iron.

5. *Granular Ophthalmia*, *granular lids*, or *trachoma*, is a very chronic and severe form of inflammation, often

leading to puckering of the conjunctiva, with turning in of the eyelashes, so that they touch the globe, and to opacity of the cornea. It is believed to be contagious, and is certainly most apt to occur in overcrowded and ill-ventilated dwellings. Some races (e.g., the Jews and the Irish) are specially liable to it. It consists in the appearance on the conjunctiva, of the lids of numerous elevations, either red and flesh-like, or pale and sago-like, with pain, itchiness, great irritability of the eyes to light, and much watery or mattery secretion. The best *treatment* is the application to the affected parts of solid sulphate of copper, or a solution of nitrate of silver, 10 to 20 grains to the ounce of water. It is, however, extremely difficult to cure, and very apt to return.

OPHTHALMOLOGY, n. *ŏf thăl-mŏl'ŏ-jĭ* [Gr. *ophthalmos.* the eye; *logos*, discourse]: science which deals with the anatomy and functions of the eye. **OPH'THALMOL'OGIST**, n. *-jĭst*, one skilled in ophthalmology.—See **EYE**: **EYE, DISEASES OF THE**: **OPHTHALMIA**.

OPHTHALMOMETER, n. *ŏf-thăl-mŏm'ĕ-tėr* [prefix *ophthalmo-;* Eng. *meter*]: in *surg.*, an instrument of the nature of compasses for measuring the capacity of the chambers of the eye in anatomical experiments: in *optics*, an instrument invented by Helmholtz for ascertaining the true distance at which an object shall be viewed for the accommodation of each eye.

OPHTHALMOPTOSIS, n. *ŏf'thăl-mŏp'tō-sĭs* [Gr. *ophthalmos*, the eye; *ptōsis*, fall, ruin]: protrusion of the whole eyeball.

OPHTHALMOSCOPE, n. *ŏf-thăl'mŏ-skōp* [Gr. *ophthalmos*, the eye; *skopĕō*, I view]: an instrument for examining the interior of the living eye. **OPHTHALMOSCOPY**, n. *ŏf-thăl-mŏs'kŏ-pĭ*, the pretended art of knowing a person's temper and manner from the appearance of the eye.—The *Opthalmoscope*, by which the interior of the eye can be examined, was invented 1851 by Prof. Helmholtz, who showed that by illuminating and examining an eye in the same direction, its deeper parts can be rendered visible. All forms of O. are adaptations of this principle. The form now generally in use consists of a concave mirror of about 10 inches focus, 1 to 3 inches in diameter, with a small hole in the centre; and certain lenses to use with it, the most important of them a separate convex lens of 2½ inches focus, and 1½ to 4 inches in diameter. Examination is facilitated by dilating the pupil of the observed eye with atropin; and for a complete examination, this is often indispensable. The person whose eye is to be examined is seated in a darkened room, with a bright light, e.g., a good gas-burner, on a level with his eye by the side of his head. The observer sits opposite him, and placing the mirror close to his own eye, and about 18 inches from the eye to be examined, reflects the light upon the latter, while he looks at it through the hole. The pupil in a healthy eye appears of a bright red or orange instead of its usual deep black. In short-sighted and long-sighted eyes, but not in normal ones, the vessels of the retina, the entrance of the optic nerve, etc., can be distinctly seen, and by their movements the deviation from the normal refraction can roughly be estimated. Opacities in the lens (Cataract, q.v.) or vitreous humor appear black, and are discovered by this method more certainly and easily than by any other. The details of the retina, choroid, etc. (or *fundus*), can be seen in two different ways. In the *indirect method* the observer, seated as above described, holds the 2½ inch convex lens about 3 in. from the eye under examination, between it and his own, when a clear image of part of the fundus, inverted and magnified about 4 diameters, appears in the red light of the pupil. In the *direct method*, the observing eye must be placed as close to the observed as the intervention of the mirror will allow, when an image of a smaller part of the fundus is seen, but erect and magnified about 14 diameters. The fundus appears of an orange or red color, varying much in different individuals. The blood-vessels of the retina are seen as darker red lines coursing over it. The entrance of the optic nerve, commonly called the *disk*, from which these vessels diverge, appears as a round disk of a much paler color. The O. has revolutionized this department of medicine, as most of the deeper affections of the eye, particularly of the optic nerve, choroid, and retina, were before recognizable only after the eyeball was removed from the body. Some of these affections have, moreover, important relations to general diseases, e.g., Bright's disease, diabetes, diseases of the brain and spinal cord ; and general medicine has benefited accordingly. It has also much facilitated the discovery and correction of errors of refraction (short- and long-sightedness, astigmatism).

OPIATE, n. *ō'pĭ-āt* [F. *opiat*, an opiate—from L. *opĭŭm*, the juice of the poppy]: any preparation or medicine which contains opium for inducing sleep or quiet: ADJ. inducing sleep; causing rest; narcotic. O'PIATED, a. *-ā-tĕd*, mixed with opium.

OPIE, *ō'pĭ*, AMELIA (ALDERSON): 1769–1853; b. Norwich, England; daughter of a physician. While very young, she wrote songs and tragedies. She was married to Opie 1798. In 1801 her first novel, *Father and Daughter*, appeared; next year a volume of graceful poems. *Adeline Mowbray* and *Simple Tales* were her next works. On her husband's death she returned to Norwich, and published a memoir of him, prefixed to his lectures; also *Temper*, *Tales of Real Life*, *Valentine's Eve*, *Tales of the Heart*, and *Madeline*. She became a Quaker 1825, and afterward published little except a volume entitled *Detraction Displayed*, and articles in religious periodicals.

O'PIE, JOHN, R.A.: English historical and portrait painter: 1761, May—1807, Apr. 9; b. at the village of St. Agnes, seven m. from Truro, Cornwall. His father, a master-carpenter, wished him to follow the same trade, but his bias for art was strong; and his attempts at portrait-painting secured the friendly help of Dr. Wolcot ('Peter Pindar'), who 1780, took him to London and proclaimed him as the 'Cornish Wonder,' a self-taught genius. O. soon attracted the world of fashion eager for a new sensation. This tide of fortune soon ebbed, but not before O. had realized a moderate competency. The loss of popular favor, however, while disappointing Dr. Wolcot's hopes of credit and profit, served to bring out more strongly O.'s manly independence and love of art. He calmly entered on the department of painting, then regarded as the only style of high art, namely, historical or scriptural subjects, executed on a large scale. His pencil was employed by Boydell in his well-meant and magnificent scheme to elevate British art; he painted also a number of works in the illustration of *Bowyer's English History*, *Macklin's Poets and Biblical Gallery*, and similar undertakings. His pictures of the *Murder of James I. of Scotland*, the *Slaughter of Rizzio*, *Jephtha's Vow*, *Presentation in the Temple*, *Arthur and Hubert*, *Belisarius and Juliet in the Garden*, are his most noted works. O. was elected an associate of the Royal Acad. 1786, and academician 1787. He devoted part of his time to literary efforts in illustration of art: these were chiefly the *Life of Reynolds* in Dr. Wolcot's ed. of Pilkington's *Dictionary of Painters;* and lectures on art, at the Royal Institution. Appointed prof. of painting, he delivered four lectures in that capacity. O. was twice married. He obtained a divorce from his first wife; his second, well known as one of the most popular novelists of the day, appreciated his character, which she depicted in a memorial vol. after his death: see OPIE, AMELIA (ALDERSON). He died in London, and was buried in the crypt of St. Paul's.

OPINE, v. *ō-pīn'* [F. *opiner*, to give one's opinion—from L. *opinā̆ri*, to esteem or believe]: to think; to suppose; to be of opinion. OPI'NING, imp. OPINED, pp. *ō-pīnd'*.

OPINICUS, *ō-pī'nĭ kŭs:* one of the fabulous creatures known in heraldry, with head and neck of an eagle, body of a lion, wings, and a short tail like that of a camel.

OPINION, n. *ŏ-pĭn'yŭn* [F. *opinion*—from L. *opinĭōnem*, belief, judgment: It. *opinione*]: settled judgment or belief of the mind; sentiment; judgment, without absolute certainty, founded on the evidence given; notion; in *OE.*, reputation. OPIN'IONATED, a. *-ā-tĕd*, unduly attached to one's own opinions; egotistical; conceited. OPIN'IONATIVE, a. *-tĭv*, fond of preconceived notions. OPIN'IONATIVELY, ad. *-tĭv-lĭ*. OPIN'IONA'TIVENESS, n. *-nĕs*, excessive attachment to one's own opinions. OPIN'IONED, a. *-yŭnd*, attached to particular opinions; conceited. OPIN'IONIST, n. *-yŭn-ĭst*, one doggedly attached to his own notions. *Note.*—OPINIONATED, etc., are coined from the older forms *opinioned*, etc., in imitation of the L. *opinātus*. OPINION OF COUNSEL, in *England and*

Scotland, technical name for the advice given by a barrister or advocate. The attorney or solicitor writes a statement of facts, called 'a case' in England, and 'a memorial' in Scotland, which ends by asking certain queries, and the answer written by the counsel is his opinion. A counsel is not liable for any damages caused by his giving a wrong opinion, though the result of gross ignorance, this being one of the privileges of counsel.—SYN. of 'opinion': idea; view; persuasion; estimation.

OPISTHOCŒLIAN, a. *ō-pĭs'thō-sē'lĭ-ăn* [Gr. *opisthĕ*, behind, backward; *koilos*, hollow]: having the vertebræ hollow at the back part.

OPISTHOTONOS, n. *ŏ'pĭs-thŏt'ō-nŏs* [Gr. *opisthĕ*, backward; *tonos*, a straining—from *teinō*, I stretch]: spasms by which the whole body is bent backward and stiffened.

OPITZ, *ō'pĭts*, MARTIN: German poet: 1597, Dec. 23—1639, Aug. 20; b. Bunzlau, Silesia. He received an education of the highest kind; and after some time at the court of the Duke of Liegnitz, he accepted, 1622, an invitation by Bethlen Gabor, Prince of Transylvania, to teach philosophy and the *humaniora* at Weissenburg; but disliking the rudeness of the country, he soon returned to the court of the Duke of Liegnitz. In 1624 his first poems were published, and in the same year his work *Von der deutschen Poeterei*, in which he laid the foundation of a system of German poetics. In 1625 he went to Vienna, where, on account of an elegy on the death of an archduke, he received a laurel crown from the hands of emperor Ferdinand II. In 1626, he became secretary, though a Protestant, to the Burggraf Karl Hannibal of Dohna, a distinguished Rom. Catholic and imperialist, and was employed in various transactions with foreign courts. In 1629, the emperor raised him to the rank of nobility. After the death of the Burggraf of Dohna, 1633, he returned to the courts of Liegnitz and Brieg. About this time he published *Vesuv*, a didactic poem, and his *Trostgedicht in Widerwärtigkeit des Kriegs*, the best of his poems, which were followed by an opera called *Judith*, a translation of the *Antigone* of Sophocles, and a translation of the Psalms. In 1638, he was appointed secretary and historiographer to Ladislaus IV. of Poland. But in the midst of his days, and when he had attained to fame and prosperity, he was cut off by the plague at Danzig. O. was more honored by his contemporaries than almost any other poet ever was. German poetry, which had been neglected and despised, began again to be esteemed and cultivated. The popularity of O., and his relations with the chiefs of the Rom. Cath. party, led to the adoption, throughout the whole of Germany, of the form given to the German language by Luther, which had previously obtained general acceptance only in the Prot. states. His poetry is characterized by careful attention to language and metre, and by reflection rather than by brilliant fancy or deep feeling. There are several editions of his works, but none complete (3 vols. Breslau 1690; 3 vols. Amst. 1646; and 3 vols. Frankfurt and Leipzig 1724).

OPIUM, n. *ō'pĭ-ŭm* [L. *opium;* Gr. *opion,* the juice of the poppy: It. *opio:* F. *opium*]: one of the most valuable of medicines; the dried juice of the unripe capsules of a species of Poppy (q.v.), *Papaver somniferum,* sometimes called the Common Poppy, and sometimes the White Poppy, though the latter name is really appropriate to only one of its varieties. The plant is a native probably of some warmer parts of Asia, though it is now common in cultivated and waste grounds throughout all s. and middle Europe, and is found occasionally in Britain. It is an annual, varying in height from one to six ft., erect, branched, of glaucous green color, with ovate-oblong sessile leaves, stem and leaves generally smooth, the branches terminated by large flowers on long stalks, the capsules globose or roundish-ovate and smooth. There are two principal varieties cultivated for the O. that they yield, which have been regarded by some botanists as distinct species; the one (*Papaver somniferum*) having generally red or violet-colored flowers, numerous flower-stalks rising together, globose capsules opening by a circle of pores under the persistent stigma, and black seeds; the other (*P. officinale*) having white flowers, solitary flower-stalks, capsules somewhat ovate, the circle of pores almost wanting, seeds white. The former variety is generally cultivated in the mountainous parts of n. India, the latter in the plain of Bengal, where the poppy-fields are described by Dr. Hooker as resembling green lakes studded with white water-lilies. The cultivation of the poppy for O. is carried on in many parts of India, though the chief O. district is a large tract on the Ganges, about 600 m. long and 200 m. broad, which was divided by the E. India Co. into two *agencies,* that of Behar and that of Benares, the central factory of the former being at Patna, and of the latter at Ghazeepore. The poppy is extensively cultivated for O. also in the Asiatic provinces of Turkey, in Egypt, and in Persia. O. of very good quality is produced, though not in large amount, in parts of Europe, and even in Britain. It is sometimes alleged that a much warmer climate than that of Britain is requisite for its profitable production, but the chief fault of the climate seems rather the frequency of wet weather. Very fine specimens have been produced, and the produce per acre has been found amply remunerative; but a great difficulty is experienced in obtaining labor at a moderate rate for a few days only at a time, and when the experiment is conducted on a small scale, only for a few hours daily. This difficulty was felt in an experiment, otherwise most successful, at Edinburgh, by Mr. Young, a surgeon, who about 1830 obtained 56 lbs. of O. from one acre of poppies, and sold it at 36*s*. a lb. It was of excellent quality. His mode of cultivation was similar to that usual in India. The seed being sown in spring on a rich soil, the plants were kept clear of weeds, and when they had flowered and produced capsules, incisions were made in the capsules, and the exuded juice collected as described below. The capsules vary from the size of a hen's egg to that of the fist. In

India, the poppy flowers in the end of Jan. and beginning of Feb. The poppy requires for profitable cultivation a rich soil, and in India is sown usually in the neighborhood of villages where manure can be easily obtained. The soil ought to be fine and loose when the seed is sown. The subsequent cultivation consists chiefly in thinning and weeding. Irrigation is practiced. Mild moist weather, with night-dews, is deemed most favorable during the collection of the O. Very dry weather diminishes the flow of the juice, and much rain is injurious. The opium poppy is cultivated for other purposes besides the production of O., concerning which see **Poppy.**

O., as a commercial article, is of great importance, exceeding indeed that of any other drug in use, and the cultivation of the O. poppy (*Papaver somniferum*) in British India is an extensive branch of agriculture, and the collection and preparation of the drug itself employs a large number of persons in the Patna, Malwa, and Benares districts of Bengal. Indeed during the whole existence of the E. India Company, the production of this drug was of the first importance; its employment as a habitual narcotic, as well as a medicine among all the eastern nations, demands an enormous supply. The seed is sown in India in the beginning of Nov.; it flowers in the end of Jan., or a little later; and in three or four weeks after, the capsules or poppy-heads are about the size of hen's eggs, and are ready for operating upon. When this is the case, the collectors each take a little iron instrument, called a *nushtur* (fig. 1); it is made of three or four small plates of iron, narrow at one end and wider at the other, which is also notched like a saw; with these instruments they wound each full-grown poppy head (fig. 2) as they make their way through the plants in the field (fig. 3). This is always done early in the morning, before the heat of the sun is felt; during the day the milky juice of the plant oozes out, and early on the following morning it is collected by scraping it off with a kind of scoop, called a *sittooha*, and transferred to an earthen vessel, called a *kurrace*, hanging at the side of the collector. When this is full, it is carried home and transferred to a shallow open brass dish, called a *thallee*, and left for a time tilted on its side, so that any watery fluid may drain out; this watery fluid is called *pusseewah*, and is very detrimental to the O.

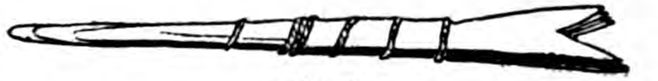


Fig. 1.

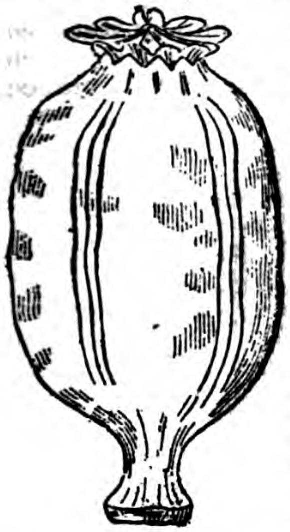


Fig. 2.

unless removed. It now requires daily attendance, and has to be turned frequently, so that the air may dry it equally, until it acquires a moderate consistency, which requires three or four weeks; it is then packed in small earthen jars, and taken to the *godowns* or factories; here the contents of each jar are turned out and carefully weighed, tested, valued, and credited to the cultivator. The O. is then thrown into vast vats, which hold the accumulations of whole districts, and the mass being kneaded, is again taken out and made into balls or cakes for the market.

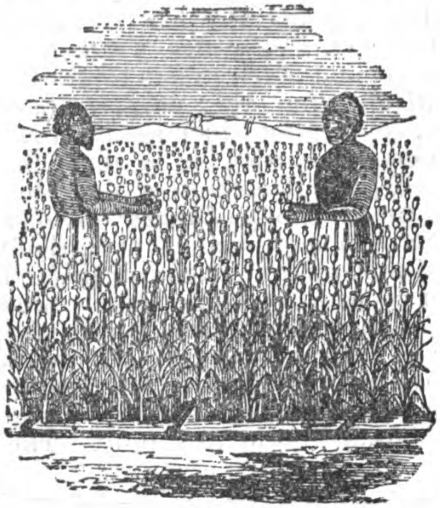


Fig. 3.

This is a very important operation, and is conducted in long rooms, the workmen sitting in rows, closely watched by the overseers to insure careful work. Before each workman (fig. 4) is a tray, and within easy reach is placed the *tagar*, a tin vessel for holding as much O. as will make three or five balls. On the tray is another basin

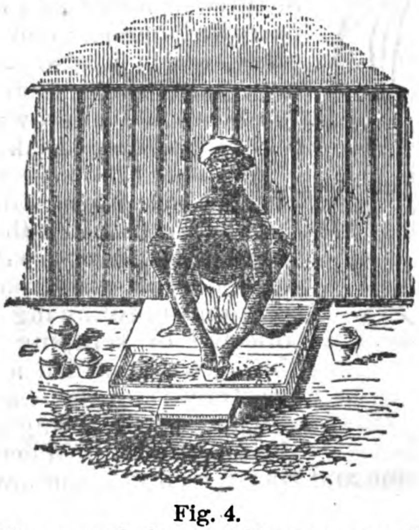


Fig. 4.

containing water, and a smaller tray; on this tray stands a brass cup, into which the ball or cake is molded, also a supply of thin layers of poppy petals, formed by laying them out overlapping each other, and pressing them upon one another; these are prepared by women in the poppy-fields, and with these is a cup filled with a sticky fluid called *lewah*, made from O. of inferior quality. The operator begins his work by taking the brass cup and placing on its bottom one of the cakes of poppy petals, which he smears over with the *lewah;* then adds other cakes of petals to overlap and adhere to the first, until the cup is lined and a coat of petals is thus formed for the O., of which he takes the exact quantity as near as he can guess, works it into a ball, and places it in the basin, so that the lining of petals incloses it and sticks to it, in consequence of the *lewah* smeared on the inner side of the thin cakes of petals. Other petals are put on the upper part of the ball, and the whole gathered round it, forming a case about as thick as a bank-note. Each man's work for the day is kept by itself, and after having been duly registered, is taken to a vast drying-room (fig. 5), where the balls are placed in tiers on lattice-work racks, and are continually turned and examined by boys, to keep them

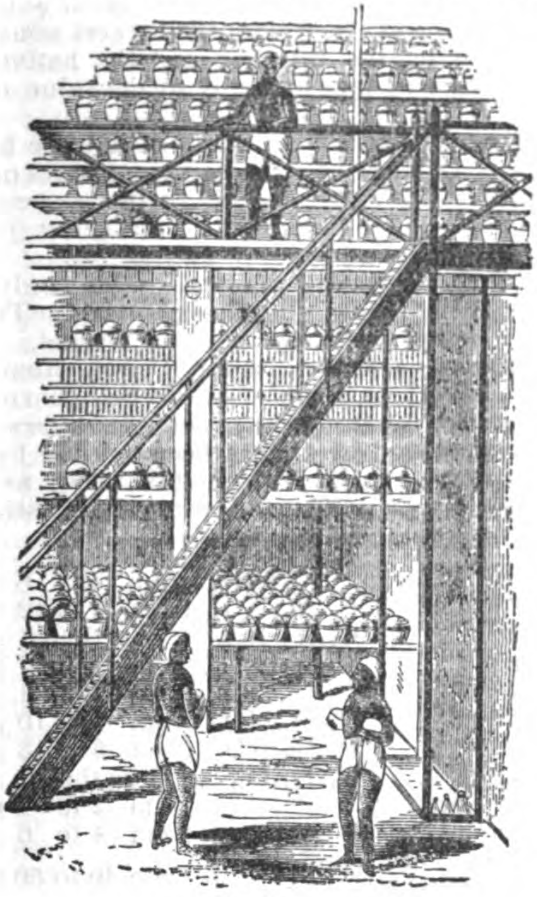


Fig. 5.

from insects and other injuries. After being fully dried, these balls are packed in chests for the market. The manufacture of O. is carried on to the greatest extent in India, but large quantities are made also in Turkey, and the latter is considered the best in quality. It is made also at Trebizond in Persia, and in Egypt; occasionally it has been produced in Germany, France, and England. Of the Indian O. there are several qualities, as Bengal, Patna or Benares opium, Garden Patna, Malwa, fine Malwa, Cutch, and Kandeish opium.

The British O. revenue for India 1875–6 was reported £8,471,425 = $41,171,125. The number of chests sold was 49,695, at £139 = $675 per chest, or £26 = $126 higher than the previous year's average. The net profit was £90 = $437.40 per chest. The area under cultivation in Bengal and Bombay was 560,608 acres. In 1880–1, 92,190 chests of O., valued at £13,600,148 = $66,096,600, were exported. Next to China, the largest consumption of Indian O. is by the Burmese and the natives of the Malacca Straits, who take annually to the value of nearly $5,000,000.

In Europe, with exceptions, which it is to be hoped are not numerous, O. is used for medicinal purposes only; and large quantities of it undergo a still further stage of manufacture, in order to separate from it the active principles morphine, narcotine, etc.

Chemical and Medicinal Properties.—The only variety recognized in the British pharmacopœia is the Turkey O. Eighteen or twenty varieties are on the market. Much is exported from Asia Minor, Egypt, Persia, Mozambique, and India. The U. S., British, and French pharmacopœia recognize as its origin only the *papaver somniferum.* The chemical composition of O. has been studied by various chemists, especially Prof. Mulder of Utrecht, and Prof. Anderson of Glasgow. The following are constituents in most kinds of opium:

	Meconic Acid, .	$C_7H_4O_7$,	from 4 to 8 per cent.
Organic Bases or Alkaloids.	Morphia, .	$C_{17}H_{19}NO_3$,	from 4 to 12 per cent.
	Codeia, . .	$C_{21}H_{21}NO_3$,	less than 1 per cent.
	Thebaia, .	$C_{19}H_{21}NO_3$,	less than 1 per cent.
	Papaverine, .	$C_{20}H_{21}NO_4$,	less than 1 per cent.
	Narcotine, .	$C_{22}H_{23}NO_7$,	from 6 to 10 per cent.
	Narceia, . .	$C_{23}H_{29}NO_9$,	from 6 to 13 per cent.
	Meconine, .	$C_{10}H_{10}O_4$,	less than 1 per cent.
	Resinous Matter,		from 2 to 4 per cent.
	Caoutchouc, .		from 4 to 6 per cent.
	Mucilage, Gum, and Extractive Matters, .		from 40 to 50 per cent.

In addition to the six alkaloids named in this table, eleven or twelve other alkaloids have been more or less positively identified.

For some of the most important and characteristic of these constituents, e.g. meconic acid, morphia, and narcotine, see their titles. The only isolated constituents of O. now used in medicine are *Codeia* (from Greek ***kōdeia*, a** poppy-head), asserted by Magendie and others to act in the same manner as, though less powerfully than, morphia; but now seldom prescribed, as it is not a pharmacopœial preparation; and *Morphia* (q.v.).

The only test given in the British pharmacopœia for the purity of O. is the determination of its percentage of morphia, a process requiring considerable chemical skill. The requirement is 6 to 8 per cent. of morphine at least.

The U. S. pharmacopœia recommends the same test; and states that a specimen dried at 185° F. should contain not less than 12 nor more than 16 per cent. of morphine. The officinal process of assay is given in the same work and in the U. S. Dispensatory at length.

Following the arrangement adopted by Pereira (*Elements of Materia Medica*, 4th ed.) above quoted, we are to consider (1) the effects of one or a few doses of O. employed medicinally or as a poison; (2) the effects of the habitual employment of O., either by chewing or smoking; (3) its good and bad effects on the different systems of organs.

1. In *small doses*, e.g., from a quarter of a grain to a grain, it acts as an agreeable stimulant, this effect being followed by a desire to sleep, accompanied by dryness of the mouth and throat, thirst, and slight constipation. When it is given in a *full medicinal dose* (two to four grains), the stage of excitement is soon followed by well-marked depression or torpor, both of bodily and mental organs, and an almost irresistible sleepiness; usually succeeded by constipation, nausea, furred tongue, headache, and listlessness. When it is administered in a dangerous or poisonous dose, the symptoms, as summed up by Dr. Christison in his work *On Poisons*, begin with giddiness and stupor, generally without any previous stimulus. The stupor rapidly increasing, the person becomes motionless, and insensible to external impressions; he breathes very slowly, generally lies quite still, with his eyes shut and the pupils contracted; and the whole expression of the countenance is that of deep repose. As the poisoning advances, the features become ghastly, the pulse grows feeble and imperceptible, the muscles are exceedingly relaxed, and, unless assistance is speedily procured, death ensues. If the person recovers, the insensibility is succeeded by prolonged sleep, which commonly ends in 24 or 36 hours, and is followed by nausea, vomiting, giddiness, and loathing of food.

2. The *habitual use of opium*, whether the drug be eaten or smoked, is undoubtedly injurious to the constitution, though as in the case of other poisons, e.g., arsenic, the system may by long use gradually accommodate itself to the poison so far at least as to escape a fatal result. Sir R. Christison, and other eminent physicians, have shown that by gradual increase very large quantities of this drug may be regularly taken with impunity; and Dr. Chapman (*Elements of Therapeutics*, II. 199) relates two remarkable cases of this kind—one in which a wineglassful of laudanum was taken several times in the 24 hours, and another (a case of cancer of the uterus) in which the quantity of

laudanum was gradually increased to *three pints* daily, a considerable quantity of solid O. also being taken in the same period.

Opium-smoking is a habit almost confined to China and the islands of the Indian Archipelago. An extract, called *chandoo*, is made into pills about the size of a pea. The following is the account given by Marsden, in *History of Sumatra*, of the process employed: 'One of these pills being put into the small tube that projects from the side of the opium pipe, that tube is applied to a lamp, and the pill being lighted is consumed at one whiff or inflation of the lungs, attended with a whistling noise. The smoke is never emitted by the mouth, but usually receives vent through the nostrils.' Medical authorities mostly agree that opium-eating is more injurious than opium-smoking. Opium-smoking in the excess which is always likely to supervene on the comparatively harmless moderate use of the drug, is the certain ruin of the individual. Both forms of the vice—smoking and eating—are said to be on the increase in the United States; the imports of O. increased from (1872) 189,354 lbs. crude, and 49,375 lbs. prepared, to (1888, June 30—1889, June 30) 391,563 lbs. crude, and 96,578 lbs. prepared: the crude was imported into 9 customs districts, the prepared into only the San Francisco district. The total annual value of the import at the last date above given (1888–9) was nearly $1,454,087. An estimate of a few years since was that the number of opium-eaters in this country was 80,000 to 85,000; of opium-smokers about 1,000,000.

3. Practical conclusions of physiologists and physicians respecting the utility and the danger of prescribing this drug in various conditions of the principal vital organs.

a. Cerebro-spinal System.—Under proper regulations it is a remedy which may be used to stimulate the circulation within the cranium, to promote sleep, to diminish abnormal or increased sensibility, and to allay pain generally; while it is contra-indicated in apoplexy, cerebral inflammation, paralysis, and hysteria. Dr. Pereira relates a case in which *one grain* of O., administered to a hysterical young woman, proved fatal.

b. Digestive System.—'Under proper regulations,' says Pereira, 'opium is an admissible remedy for the following purposes: to diminish excessive hunger; to allay pain, when unaccompanied by inflammation; to diminish the sensibility of the digestive organs in cases of acrid poisoning, and in the passage of biliary calculi; to produce relaxation of the muscular fibres of the alimentary canal in colic, and of the gall-ducts in the passage of calculi, and to diminish excessive secretion from the intestinal canal in diarrhea;' while it is contra-indicated 'in diminished secretion from the gastro-intestinal membrane, in extreme thirst, in loss of appetite and weak digestion, in obstinate costiveness, and in diminished excretion of bile.'

c. Vascular System.—In vascular excitement with great diminution of power, as after hemorrhage, O. is often serviceable; but when the pulse is strong as well as quick, or when there is simultaneously a tendency to abnormal sleepiness, it is contra-indicated.

d. Respiratory System.—'Opium, under proper regulations, may be useful to diminish the contractility of the muscles of respiration, or of the muscular fibres of the air-tubes, as in spasmodic asthma; to diminish the sensibility of the bronchia in the second stage of catarrh, and thereby to allay cough by lessening the influence of the cold air; and, lastly, to counteract excessive bronchial secretion;' while it is contra-indicated in difficulty of breathing, arising from a deficient supply of nervous energy, as in apoplectic cases; in cases in which the venous is imperfectly converted into arterial blood; and in the first stage of catarrh and pneumonia, both from its checking secretion, and from its tendency to impede the due arterialization of the blood.

e. Urinary System.—O. is a valuable remedy to allay the pain in the kidney and adjacent parts in cases of renal calculi, also to produce relaxation of the ureters when the calculi are passing along these tubes; it is of great service also in certain forms of irritable bladder.

There can be no doubt that the essential and primary operation of O. is on the nervous system, the other effects being mostly secondary. Its action is proportionally much more powerful on infants than on adults—a single drop of laudanum having been known to prove fatal to an infant.

O. has been deemed the most valuable remedy of the whole materia medica. 'For other medicines,' says Dr. Pereira, 'we have one or more substitutes; but for opium, none—at least in the large majority of cases in which its peculiar and beneficial influence is required.' In combination with tartar emetic, it has been strongly recommended in fever with much cerebral disturbance; in association with calomel, it is the most trustworthy remedy in cases of inflammation of membranous parts; in insanity, its value cannot be overestimated; it is the remedy chiefly trusted to in delirium tremens; it is more serviceable than any other medicine in diabetes; and it has marked efficiency, in small doses (10 to 15 drops of laudanum three times a day) in promoting the healing of ulcers in which granulation proceeds too slowly.

In addition to the solution of Muriate of Morphia (q.v.), which, on the whole, is the best preparation of O. for internal use in the majority of cases, the British pharmacopœia contains an O. pill (containing one part of O. in five of the pill); a pill of lead and O. (used chiefly in pulmonary hemorrhage); an aromatic powder of chalk and O. (containing one part of O. in 40 of the powder); powder of ipecacuan and O. (or Dover's Powder [q.v.], containing one part of O. in ten of the powder); powder of kino and O. (containing one part of O. in 20 of the powder, and, like the aromatic powder, used chiefly in diarrhea); tincture (see LAUDANUM), and camphorated tincture of O. (commonly known as Paregoric Elixir, much used in chronic cough—containing two grains of O. in the fluid ounce); also an enema; a wine (chiefly for local application to the eye in ophthalmia); an ointment of galls and O. (for external application to piles); and a liniment and a plaster, to remove local superficial pains.

In a case of poisoning by O., the first and most essential point is the evacuation of the contents of the stomach. The stomach-pump should be employed, and strong coffee should then be pumped into the stomach after the removal of its contents. The next best remedy is an emetic of sulphate of zinc (about a scruple); and if this is not at hand, a dessert-spoonful of flour of mustard, stirred up in a tumbler of warm water, will usually produce the desired effect. The patient must, if possible, be prevented from falling asleep, and for this purpose he should be kept constantly walking between two strong men, while a third person in the rear should, at short intervals, flick him sharply with a rough wet towel, or (if procurable) a good birch rod. Cold water should also be occasionally dashed over the head and chest. In a few apparently hopeless cases, death has been averted by artificial respiration, and by application of electro-magnetism.

OPOBALSAM, n. *ŏp'ŏ-bawl'săm* [Gr. *opos*, juice; *balsamon*, the balm-juice, balsam]: the balsam of Gilead, an oleo-resin of a peculiar fragrancy; the secretion from the *Balsămoden'dron gilĕăden'sĕ*, ord. *Burserācĕæ:* see BALSAM: GUM.

OPODELDOC, n. *ŏp'ŏ-dĕl'dŏk* [word coined by Paracelsus]: popular synonym for *Soap Liniment* (q.v.). *Note.*—The *opo* is the same as the *opo* in *opopanax*, *opobalsam*, etc., doubtless from the Gr. *ŏpos*, juice. It has been suggested by an eminent Anglo-Saxon scholar that the original word was *opodilla*, and that *doc* or *dock* was added merely as a gloss to *dilla*—a view confirmed by the fact, that in Ælfric's *Glossary*, *dill* (*dilla*) is Englished by *dock*.

OPOPANAX, n. *ŏ-pŏp'ă-năks* [Gr. *opopănax*—from *opos*, juice; *panax*, a plant, all-healing (see PANACEA)]: a gum-resin, the dried juice of a plant, imported in loose granules or drops, used as a medicine; obtained by puncturing the roots of *Opopŏnax chirōnium*, native of s. Europe, ord. *Umbellĭfĕræ.* Ancient physicians attached great importance to O. as an antispasmodic. Hippocrates, Theophrastus, and Dioscorides have each left descriptions of it. The plant grows generally throughout s. Europe, and the gum is still collected, but is little used.

OPORTO, *ō-pōr'tō* (Portug. *O Porto*, the port): city of Portugal; after Lisbon, the most important seaport of the country; in the province of Minho, on the right bank, two m. from the mouth of the Douro; lat. 41° 9′ n., long. 8° 37′ w.; 195 m. n.n.e. of Lisbon. Though possessing few imposing edifices, the town, seen from a distance, with its irregular outline marked with many towers, its whitewashed houses gleaming among trees and terraced gardens, has a fine picturesque effect. Its picturesqueness, however, has been secured at some cost of comfort, as many of its streets are narrow, dirty, and so steep as to be impassable for carriages. Of the old walls that surrounded the ancient town, remains are still seen. The principal street is the *Rua Nova dos Inglezes*, a spacious, handsome, modern thoroughfare, from which is obtained a good view of the Bishop's Palace, which seems hung high in air. Here is one of the finest edifices in O., the English Factory House, of white granite with beautiful façade, and comprising on a magnificent scale all appurtenances of a club-house, e.g., ball room, library, refreshment-room, etc. The houses in the *Rua Nova de S. João*, most regular street in the city, are lofty, faced with gayly painted and gilt balconies. Of the 11 squares, the greatest is the *Praça de San Ovidio* on a height, with beautiful buildings, and a terrace with a fine seaward view, and planted with trees. On the high rocks, on the s. bank of the river, stands the convent of *da Serra*, formerly extraordinarily rich. The most beautiful of the convents was that of *S. Bento*, now converted into barracks. The cathedral, originally a noble edifice, but infamously modernized, stands near the Bishop's Palace. The *Torre dos Clerigos* (Tower of the Clergy) said to be the highest in Portugal, was built 1748. Formerly there were in all 80 convents and chapels in the city. Of existing institutions, there are four hospitals, and numerous educational and benevolent establishments. O. is the principal industrial seat in the country. It carries on manufactures of linen, silk, cotton, and woolen fabrics, cloth of gold, silk and cotton hosiery, lace, buttons, gold and silver wire, cutlery and hardware, excellent furniture, pottery, glass, leather, paper, hats, sails, and the articles required on ship-board. Royal tobacco and soap-works, two iron-foundries, and several sugar-refineries are in operation. The entrance to the Douro is rendered highly dangerous by a shifting bar of sand; yet the commercial traffic is considerable. O. has imported from England in a single year cotton goods to the value of £330,000, and woolen goods, £70,000. Ships are built here. In 1875 the port owned 137 ships of 38,540 tons.

In ancient times, the site of O. was occupied by the harbor-town *Portus Cale*, afterward *Porto Cale*, from which has been derived the name of the kingdom, Portugal. It was an important city during the supremacy of the Moors, was destroyed 820 by Almansor of Cordova, but was restored and peopled by a colony of Gascons and French 999. It was famous for the strength of its fortifications during the middle ages, its walls being 3,000 paces in circumference, 30 ft. high, flanked with towers. From the 17th to the 19th c., O. has been the scene of an unusual number of popular insurrections. In 1808, it was taken by the French; but in the following year it was retaken by an Anglo-Portuguese force under Wellington. In 1832, Dom Pedro, ex-emperor of Brazil, was unsuccessfully besieged for a year in this city by the forces of Dom Miguel.—Pop. 80,295; with its four suburban districts 108,346.

OPOSSUM, n. *ŏ-pŏs'sŭm* [originally *opassom*, in the language of the Indians]. (*Didelphis*): genus of *Marsupiata*, quadrupeds having ten cutting teeth in the upper jaw, and eight in the lower, one canine tooth on each side in each jaw, three compressed premolars, and four sharply-tuberculated molars on each side—50 teeth in all; tongue bristly; tail long, prehensile, and in part scaly; feet plantigrade; five toes on each foot, their claws long and sharp; but the inner toe of the right foot converted into a thumb, destitute of a claw, and opposable to the other digits; muzzle long and pointed, mouth very wide, ears large and destitute of hair. The unwebbed feet and non-aquatic habits distinguish this genus from *Cheironectes* (q.v.), also belonging to the family *Didelphidæ*. But the genus *Didelphis* itself is divided by some naturalists into several genera; and there are differences not unimportant, particularly in the well-developed pouch of some species, and the merely rudimentary pouch or abdominal folds of others. All existing species are American, but fossil species are found in other parts of the world. The opossums were the first marsupial animals known, and are noticed as very wonderful creatures by some of the earliest writers on America. Some of the smaller species much resemble rats and mice, except in their long and pointed muzzle; others greatly resemble shrews; the largest known species are scarcely equal in size to a large cat. It is in some of the smaller species that the pouch is rudimentary; all the larger species have a well-developed pouch, in which the young are carried, and to which, even after beginning to venture forth from it, they retreat on the approach of danger. The young of the species which have a merely rudimentary pouch, also remain attached to the nipple of the mother for a time; and afterward for a time are carried on her back, intwining their prehensile tails with hers, and clinging to the fur of her back.—The VIRGINIAN O. (*D. Virginiana*) is one of the largest species. It abounds in warmer parts of N. America, and its range extends considerably n. of Va. Its form is robust, its head very large, its color dull white; its fur long, fine, and woolly, thickly interspersed with longer coarse white hairs, except on the

Virginian Opossum (*Didelphis Virginiana*).

head and some of the upper parts, where the hair is short and close. The tail is not quite so long as the body. The Virginian O. lives much in forests and among branches of trees, to which it usually retreats to devour its prey, twining its tail around a branch for security. Its food consists of small quadrupeds and reptiles, birds' eggs, and insects; also in part of fruits and the juicy stalks of plants. It often visits poultry-yards, and is cunning in its stealthy quest of prey; though otherwise it seems, like the other *Marsupiata*, to be very low in the scale of intelligence. It seeks to escape from enemies by running to the woods and ascending a tree; but if escape is impossible, it feigns death, and maintains the imposture in very trying circumstances, however it may be kicked and beaten; but the true state of the case may be ascertained by throwing it into water; hence the colloquial phrase 'playing 'possum.' The female sometimes produces 16 young at a birth; the young when born are blind, naked, and shapeless, and weigh scarcely more than a grain each; they do not begin to leave the pouch until they have attained about the size of a mouse. The female O. shows very strong attachment to her young. The O is very easily tamed, but its strong odor makes it an unpleasant pet. The flesh is said to be good food. The hair is woven into garters and girdles by Indian women.—The CRAB-EATING O. (*D cancrivora*) of Guiana and Brazil, nearly as large as the Virginian O., lives chiefly in marshy places, and feeds much on crabs. The smaller species are numerous in tropical America.—The name O. is often given in Australia to the Phalangers (q.v.).

OPPELN, *ŏp'pĕln:* town of Prussian Silesia, cap. of the govt. dist. of the same name, on the Oder, 51 m. s.e. of Breslau. Since 1816, when it was erected into an especial seat of govt. for Upper Silesia, the town has been much beautified with new edifices and with parks and gardens. It contains four churches—one, Adelbert's Church, founded 995—an old castle on the island Pascheke in the channel of the Oder, a town-house, and theatre. There is considerable transit-trade in timber, zinc, lead, hardware, cattle, and wines; and there are manufactures of ribbons, linen goods, leather, and pottery. Pop. (1880) 14,447.

OPPENHEIM, *ŏp'pĕn-hīm:* town of the grand duchy of Hesse-Darmstadt, province of Rhenish Hesse, on the left bank of the Rhine, 10 m. s. by e. from Mayence, and on the railway between Mayence and Spires. It stands on the steep slope of a hill abounding in vineyards, and has active trade in wine. O. occupies the site of the Roman castle of Bauconia, and was made a royal palatinate under the Carlovingians. It afterward became one of the most important free towns of the empire. It was taken 1218 by Abp. Adalbert of Mayence, 1620 by the Spaniards, 1631 by the Swedes under Gustavus Adolphus, and 1634 by the imperialists, suffering much on all these occasions. In 1689 the French under Melac almost entirely destroyed it. The church of St. Catharine, fine specimen of the German architecture of 1262–1317, remains in ruinous condition, except the e. part. Pop. 3,300.

OPPERT, *ŏp'pĕrt*, F. *o-pār'*, JULES, PH.D.: b. Hamburg, 1825, July 9. After completing the law course at Heidelberg he studied Oriental languages at Bonn and afterward at Berlin, giving special attention to the Zend language and its literature. On account of his Jewish descent and his adhesion to the Hebrew faith he was unable to secure a professorship in a German university. He removed to France, was prof. of German at Laval 1848, and at Rheims 1850, and was a member of the scientific expedition sent by the French govt. to Mesopotamia 1851. Soon after his return he took out naturalization papers and became a citizen of France. The Institute grand prize of 20,000 francs was awarded him 1854 for his method of interpreting cuneiform inscriptions. He received 1857 the appointment of prof. of Sanskrit at the school connected with the Imperial Library. He has published *Études Assyriennes*, *Grammaire Sanscrite*, *Fragments Mythologiques*, *Deux textes très anciens de la Chaldée*, and other important works.

OPPIDAN, n. *ŏp'pĭ-dăn* [L. *oppĭdum*, a city or town]: at *Eton*, a boy who is not a king's scholar, and who boards in the town: ADJ. relating to a town.

OPPONENT, n. *ŏp-pō'nĕnt* [L. *opponens*, or *opponen'tem*, setting or placing against—from *ob*, against; *pono*, I set or place: It. *opponente*]: one who opposes, as in argument or controversy; an adversary; a rival: ADJ. that opposes; adverse. OPPO'NENCY, n. *-nĕn-sĭ*, an exercise for an academical degree; the opening of a disputation.—SYN. of 'opponent': enemy; antagonist; opposer; foe.

OPPORTUNE, a. *ŏp'pŏr-tūn* [F. *opportun*—from L. *opportūnus*, fit, convenient—from *ob*, over, against; *portus*, the harbor: It. *opportuno*]: well-timed; seasonable; proper; convenient. OP'PORTUNE'LY, ad. *-lĭ*. OP'PORTUNE'NESS, n. *-nĕs*, the quality or condition of being opportune or timely. OPPORTUNITY, n. *ŏp'pŏr-tū'nĭ-tĭ* [F. *opportunité*—L. *opportunitas*]: fit or convenient time, place, or occasion; suitableness of circumstances to any end.—SYN. of 'opportunity': occasion; occurrence; convenience; time.

OPPOSE, v. *ŏp-pōz'* [F. *opposer*, to oppose—from F. *poser*, to place: L. *oppositus*, set or placed against—from *ob*, against; *positus*, set or placed]: to set against; to act against; to resist; to put one's self in opposition, as a competitor; to object or act against, as in a controversy or debate; to place, as an obstacle; in *OE.*, to place in front or over against; to act adversely. OPPO'SING, imp. OPPOSED', pp. *-pōzd'*. OPPO'SER, n. *-zėr*, one who opposes. OPPO'SABLE, a. *-ză-bl*, capable of being opposed or resisted. OPPOSITE, a. *ŏp'pō-zĭt* [F.—L.]: standing or placed in front: facing; contrary; in *bot.*, applied to leaves placed on opposite sides of a stem at the same level: N. the reverse; that which is contrary. OP'POSITELY, ad. *-lĭ*. OP'POSITENESS, n. *-nĕs*, the state of being opposite or contrary. OPPOSITION, n. *ŏp'pō-zĭsh'ŭn* [F.—L]: standing over against; resistance; hostility; contrariety of interests or designs; contradiction. in *astron.*, the aspect of heavenly bodies when 180° apart—

that is, when one heavenly body is in the quarter of the heavens directly opposite to another, as a planet to the sun: in *politics*, the collective body of the opponents of a ministry or goverment, especially in either house of the British parliament. The existence of a fair and temperate opposition, keeping watch over the acts of the ministry, is conducive to good government; but mere factious obstruction may seriously damage public interests. The name Opposition is not usually applied to a party merely because opposed to the existing administration, but only when there is likelihood of that party's succeeding to power on a change of government. **Op'posi'tionist**, n. *-ŭn-ĭst*, one who belongs to the opposing party. **Oppositive**, a. *ŏp-pŏs'ĭ-tĭv*, that may be put in opposition. **Oppose'less**, a. irresistible; incapable; of being opposed.—Syn. of 'oppose': to resist; withstand; thwart; combat; contradict; deny; oppugn; check; obstruct; contravene; hinder.

OPPRESS, v. *ŏp-prĕs'* [F. *oppresser*—from mid. L. *oppressārĕ*, to overburden: L. *oppressus*, pressed against, crushed —from *ob*, against; *premo*, I squeeze]: to treat with unjust rigor, severity, or hardship; to overburden; to sit or lie heavily on; to overpower. **Oppres'sing**, imp. **Oppressed'**, pp. *-prĕst':* Adj. overburdened; depressed. **Oppres'sor**, n. *-sėr*, one who oppresses or harasses with unjust severity. **Oppres'sion**, n. *-prĕsh'ŭn* [F.—L.]: the imposition of unreasonable burdens or exactions; the state of being overburdened; cruelty; severity; dulness of spirits; a sense of heaviness, as in respiration. **Oppres'sive**, a. *-sĭv*, unjustly or excessively severe; tyrannical; extortionate; overwhelming. **Oppres'sively**, ad. *-lĭ*. **Oppres'siveness**, n. *-nĕs*, the quality of being oppressive.

OPPROBRIOUS, a. *ŏp-prō'brĭ-ŭs* [L. *opprobrĭōsus*, full of reproach—from *opprōbrĭum*, reproach, disgrace: It *obbrobrioso;* Sp. *oprobioso*, opprobrious]: offensive; reproachful; abusive; infamous; rendered hateful. **Oppro'briously**, ad. *-lĭ*. **Oppro'briousness**, n. *-nĕs*, or **Oppro'brium**, n. *-brĭ ŭm*, reproach mingled with contempt or disdain; disgrace; ignominy.

OPPUGN, v. *ŏp-pūn'* [OF. *oppugner*, to oppugn—from L. *oppugnārĕ*, to fight against, to assault—from *ob*, against; *pugna*, a fight: It. *oppugnārĕ*]: to oppose or resist—used only of verbal or written warfare. **Oppugn'ing**, imp. **Oppugned**, pp. *ŏp-pūnd'*. **Oppugn'er**, n. *-ėr*, one who opposes or attacks in verbal or written warfare. **Oppugnancy**, n. *ŏp-pŭg'năn-sĭ*, in *OE.*, opposition.

OPSIOMETER, n. *ŏp'sĭ-ŏm'ĕ-tėr* [Gr. *opsis*, sight; *metron*, measure]: an instrument for measuring the extent or limits of distinct vision in different individuals.

OPTATIVE, a. *ŏp'tă-tĭv* [F. *optatif*, optative—from L. *optatīvus*, expressing a wish—from *optātŭs*, wished or desired]: expressive of desire or wishing; in *Gr. gram.*, applied to a mood of the verb. **Optation**, n. *ŏp-tā'shŭn*, expression of a wish.

OPTIC, a. *ŏp'tĭk*, or OPTICAL, a. *ŏp'tĭ-kăl* [Gr. *optĭkos*, relating to the sight—from *opsomai*, I shall see: F. *optique*]: relating to the sight; visual; relating to the science of optics. OP'TIC, n. an organ of sight. OP'TICALLY, ad. *-lĭ*. OPTICS, n. plu. *ŏp'tĭks*, the science which treats of everything that pertains to light or vision, and the construction of such instruments as telescopes, microscopes, etc., in which light is the chief agent (see OPTICS, below): *familiarly*, the organs of sight. OPTICIAN, n. *ŏp-tĭsh'ăn*, one who constructs and sells instruments and glasses to aid vision. OPTIC NERVES, the second pair of nerves which proceed directly from the brain, and which are the nerves of sight: see EYE.

OP'TICAL ILLU'SION: deceptions arising in, or producing their effect through, the sense of sight, the bodily sense most liable to be deceptive. This sense often deceives us as to the distance, size, shape, and color of objects; it frequently makes them appear in situations where their existence is impossible; and often makes us think them movable when they are not so, and *vice versâ*. An object appears to us as large or small, near or distant, according as the rays from its opposite borders meeting at the eye form a large or a small angle: when the angle is large, the object is either large or near; when small, the object must be small or distant. Practice alone enables us to decide whether an object of large apparent size is so on account of its real size, or of its proximity; and our decision is arrived at by a comparison of the object *in position*, with other common objects, such as trees, houses, etc., which may chance to be near it, and of which we have by experience come to form a correct idea. The same is, of course, true of apparently small objects. But when all means for comparison are removed, as when we see a distant object floating on an extensive sheet of water, or erect in an apparently boundless sandy plain, where no other object meets the eye, then our judgment is completely at fault. Imperfection in the acquired perceptions of sight, as it is called, produces many other illusions; it leads us to consider spherical solids at a distance as flat disks, and deceives us regarding the size of objects, by their color; the sun appears larger than he would if illumined by a fainter light, and a man in a white garment seems larger than if he wore a dark dress. Illusions are produced also by external causes: for instances, see MIRAGE: REFLECTION: REFRACTION.

The property which the eye possesses of retaining an impression for a very brief, though sensible period of time (about one-quarter of a second), after the object which produced the impression has been removed, produces a third class of illusions. Common examples of this are the illuminated circle formed by rapid revolution of an ignited carbon point, piece of red-hot iron, or other luminous body, and the fiery curve produced by a red-hot shot projected from a cannon. Another form of illusion is produced to a person who is seated in a vehicle in motion, especially when the motion is so equable as not to be felt by the person himself.

The illusion is most complete when the attention is riveted on an object several yards off; this object then appears as a centre round which all the other objects seem to revolve, those between the observer and the object moving backward, and those beyond the object moving forward. This illusion occurs on a large scale in the apparent motion of the heavenly bodies. Other illusions arise from a disordered state of the organs of vision; such are the seeing of things double or movable (when they are not so), or of a color different from the true one; the appearance as of insects crawling over a body at which the eye is directed, etc.

OP'TICS: science whose object is investigation of the laws that regulate the phenomena of light and vision. For the nature of light, see LIGHT: see also various connected topics, such as CHROMATICS: DIFFRACTION: INTERFERENCE: LENS: POLARIZATION: REFLECTION: REFRACTION: SPECTRUM: ETC.: also MICROSCOPE: TELESCOPE. This article is a brief historical sketch of the rise and progress of the science.

O., as a science, is entirely of modern growth, for though the Greeks and their disciples the Arabs had made some progress in mathematical optics, their knowledge was confined to the law of reflection and its immediate consequences. Euclid, Aristotle, Archimedes, Hero, and Ptolemy were acquainted with the fact that light is transmitted in straight lines, but with the important exception of Aristotle, and some of his followers, the ancient philosophers believed that rays proceeded *from* the eye *to* the object, instead of in the contrary direction. Ptolemy was well acquainted with atmospheric refraction. Alhacen (1070) and Vitellio the Pole (1260) were almost the only cultivators of this science during the middle ages, and their additions to it were unimportant. The lens, though known from early antiquity, was not applied as an aid to defective eyesight till after the time of Roger Bacon. Jansen, Metius, and Galileo separately invented the telescope about the beginning of the 17th c.; and the last-mentioned philosopher, by its means, made various important astronomical discoveries. Kepler, a short time afterward gave the true theory of the telescope, explained the method of finding the focal length of lenses, and applied it to find the magnifying power of the telescope, besides pointing out the mode of constructing an instrument better adapted for astronomical purposes than that of Galileo; he also made useful experiments on the nature of colors, and showed that images formed on the retina of the eye are inverted, a fact previously discovered by Maurolycus of Messina. From this period the science of O. steadily advanced, and its treasury of facts received numerous additions through the labors of De Dominis, Snell (discoverer of the law of refraction 1621), Descartes, Fermat, Barrow, Mariotte, and Boyle. Till the time of Newton it was generally believed that color was *produced* by refraction, but that philosopher showed by a beautiful series of experiments that refraction only separates the colors already existing in white light. In his hands the theory and construction of the telescope underwent many valuable improvements, and 1672 the description of his *reflecting* telescope was submitted to the Royal Soc. Gregory had constructed an instrument on similar principles some years before. About the same time, Grimaldi made his interesting series of experiments on the effects of diffraction, and noticed the remarkable fact of the interference of one pencil of light with the action of another. The complete theory of the rainbow, with an elegant analysis of the colors of thin plates, and the hypothesis concerning the nature and propagation of light, now known as the 'corpuscular' theory, completed Newton's contributions to the science. The important services of the ingenious but eccentric Hooke cannot be easily stated in such a brief abstract, as he discovered a little of everything, completed nothing, and occupied himself to a large extent in combating faulty points in the theories of his contemporaries. It must not, however, be forgotten that he has as much right as Huyghens to the credit of originating the undulatory theory, the favorite one at present. The double refraction of Iceland spar was discovered (1669) by Bartholin, and fully explained 1690 by Huyghens, propounder of the undulatory theory, who also considerably aided the progress of mathematical optics. The velocity of light was discovered by Römer (1675), and 1720 the aberration of the fixed stars and its cause were made known by Bradley, who likewise determined with accuracy the amount of atmospheric refraction. Bouguer, Porterfield, Euler, and Lambert rendered essential service to physical optics; the same was done for the mathematical theory by Dollond (inventor of the achromatic telescope), Clairaut, Dalembert, Boscovich, etc.; while in later times the experiments of Delaval on the colors produced by reflection and refraction; the discussion of the phenomena arising from unusual reflection or refraction, carried on by Vince, Wollaston, Biot, Monge, and others; the discovery of polarization of light by Malus (1808), and its investigation by Brewster, Biot, and Seebeck; of depolarization by Arago (1811), and of the optical properties as connected with the axes of crystals (1818) by Brewster; and the explanation of these and other optical phenomena, in accordance with the undulatory hypothesis by Young—discoverer of the *Interference* (q.v.) of rays—and Fresnel, went far to give optics a width of scope and symmetry possessed by few other sciences. The development of the undulatory theory and of optical science generally has been carried on in the present century by Lloyd, Airy, Cauchy, and others; and more recently important discoveries in connection with the physical modifications and chemical properties of light have been made (the latter, as far as the spectrum is concerned, chiefly by Kirchhoff), for a notice of which, and other discoveries, see **PHOTOGRAPHY: SPECTRUM: ETC.**

OPTIMATES, n. plu. *ŏp′tĭ-mā′tēz* [L. *optimātes*, the grandees—from *optĭmus*, the best]: the nobility of anc. Rome; the conservative or aristocratic party, as opposed to the democratic or progressive *populares:* men of wealth were not necessarily optimates unless they had also personal influence and a following. OPTIME, n. *ŏp′tĭ-mē*, in *Cambridge University* till recently, one who stood in the second or third class of final honors in mathematics, called senior or junior—the *wranglers* were comprehended in the first class. OPTIMISM, n. *ŏp′tĭ-mĭzm*, doctrine that everything, whether good or evil, is ordered for the best, the opposite of *pessimism*. OP′TIMIST, n. *-mĭst*, one who holds that all events are ordered for the best: see OPTIMISM, below.

OP′TIMISM: doctrine of those philosophers and divines who hold that the existing order of things, whatever its seeming imperfections of detail, is nevertheless, as a whole, the most perfect or the best which could have been created, or which it is possible to conceive. Some of the advocates of O. content themselves with maintaining the absolute position, that though God was not by any means under obligation—even to His own perfection of character—to create the most perfect order of things, yet the existing order *is de facto* the best; others contend, in addition, that the perfection and wisdom of Almighty God necessarily require that His creation should be the most perfect which it is possible to conceive. The philosophical discussions of which this controversy is the development are as old as philosophy itself, and form the groundwork of all the systems, physical as well as moral, whether of the Oriental or of the Greek philosophy; of Dualism, Parsism, and of the Gnosticism and Manicheism which afflicted the Christian Church, in the east; and in the west, of the Ionian, the Eleatic, the Atomistic; no less than of the later and more familiar, Stoic, Peripatetic, and Platonistic Schools. In the philosophical writings of the fathers, of Origen, Clement of Alexandria, and above all of Augustine, the problem of the seeming mixture of good and evil in the world is the great subject of inquiry, and through all the subtleties of the mediæval schools it continued to hold an important and prominent place. But the full development of the optimistic theory as a philosophical system was reserved for Leibnitz (q.v.). It forms the subject of his most elaborate work, *Theodicea*, the main thesis of which is, briefly—that among all the systems which were present to the infinite intelligence of God, as possible, God selected and created, in the existing universe, the best and most perfect, physically as well as morally. The *Theodicea*, pub. 1700, was designed to meet the skeptical theories of Bayle, by showing not only that the existence of evil, moral and physical, is not incompatible with the general perfection of the created universe, but also that God, as all-wise, all-powerful, and all-perfect, has chosen out of all possible creations the best and most perfect; that had another more perfect creation been present to the divine intelligence, God's wisdom would have required of Him to select it; and that if another, even equally perfect, had been possible, there would not have been any sufficient determining motive for the creation of the present world. Omitting details of the controversial part of the system, it suffices to say that the existence of evil, both moral and physical, is explained as a necessary consequence of the finiteness of created beings; and it is contended that in the balance of good and evil in the existing constitution of things, the preponderance of the former is greater than in any other conceivable creation. The great argument of the optimists is the following: If the present universe be not the best that is possible, it must be that, (1) God did not know of the (supposed) better universe, or that (2) God was not able to create that better one, or that (3) God was not willing to create it. Now, they continue, every one of these hypotheses is irreconcilable with the attributes of God: the first, with His omniscience; the second, with His omnipotence; the third, with His goodness. See Leibnitz, *Theodicea;* Baumeister's *Historia de Mundo Optimo.* While it is not difficult to accept the conclusion known as optimism, the above argument can scarcely be trusted to prove it, inasmuch as the second of the hypotheses referred to cannot be shown irreconcilable with the omnipotence of God. It is not derogatory to God's omnipotence that it cannot make 2 and 2 equal to 99, since that would be absurd and no proper object of power; and though none may be able to prove that the creation of a better universe is thus beyond proper omnipotence, none can prove that it is properly within the range of omnipotence; and in lack of such proof the argument as above fails. Optimism does not need such evidence. He who chooses to believe it has right to say that it is *too good not to be true;* and any man has a right to choose to believe the best that he knows or can conceive, in default of proof that that best is absurd or impossible. It is the suicide of humanity itself to deny this right without the most convincing proof. The view of the universe diametriaclly opposed to O. is Pessimism (q.v.), and has of late been frequently maintained, and with great ingenuity and acuteness: see Sully's *Pessimism* (1877).

OPTION, n. *ŏp'shŭn* [F *option*—from L. *optĭōnem*, free choice—from *optārĕ*, to choose, to wish for]: the power of choosing; right of choice; selection; election; preference; on the *stock exchange*, the liberty to sell or buy stock in a time-bargain at an agreed price. **Op'tional**, a. *-ăl*, leaving or left to choice or preference. **Op'tionally**, ad. *-lĭ*, with the privilege of choice.

OPTOGRAPH, n. *ŏp'tŏ-grăf* [Gr. *opsomai*, I shall see; *graphō*, I write]: a telescope for copying landscapes.

OPTOMETER, n. *ŏp-tŏm'ĕ-ter* [Gr. *optikos*, relating to sight; *metron*, measure]: an instrument for measuring the limits of distinct vision; also **Optimeter.**

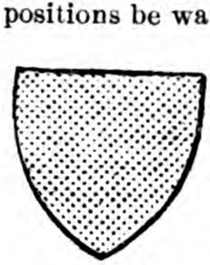
OPULENT, a. *ŏp'ū-lĕnt* [F. *opulent*—from L. *opulens*, or *opulen'tem*, wealthy, rich—from *opes*, wealth: It. *opulente*]: having large means; rich; wealthy. OP'ULENTLY, ad. *-lĭ*. OP'ULENCE, n. *-lĕns*, and sometimes OP'ULENCY, n. *-lĕns-ĭ*, wealth; riches; affluence.

OPUN'TIA: see PRICKLY PEAR.

OPUSCLE, n. *ō-pŭs'sl*, or OPUSCULE, n. *ō-pŭs'kūl* [L. *opus'culum*. a little work—from *opus*, a work]: a little work; a brochure.

O'PUS OPERAN'TIS [Lat. work of the worker]: theological phrase, denoting that the effect of a particular ministration or rite is primarily and directly due, not to the rite itself (*opus*), but to the dispositions of the recipient (*operans*). Thus, in the act of kissing or praying before a crucifix, of sprinkling one's self with holy water, of telling the prayers of the rosary upon blessed beads, the fervor and personal piety of the supplicant, and not the material object which he thus puts to its religious use, is held to be the efficient cause of the grace thereby imparted. The term is used chiefly by writers of the Rom. Cath. schools, in whose system, however, the sacramental rites are held to differ from all others in this respect. See OPUS OPERATUM.

O'PUS OPERA'TUM [Lat. work wrought]: phrase in the Rom. Cath. theol. schools denoting the manner of the operation of the sacramental rites in the production of Grace (q.v.). It is intended to imply that the ministration of the rite (*opus*) is in itself, through the institution of Christ, an efficient cause of grace, and that, though its operation is not infallible, but requires and presupposes certain dispositions on the part of the recipient, yet these dispositions are but *conditiones sine qua non*, and do not of themselves produce the grace; hence, when the sacraments are administered to dying persons in a state of apparent insensibility, this is done in the hope and on the presumption that the dying person may, though seemingly unconscious, be nevertheless really disposed to receive the sacrament; but it is by no means held that if these dispositions be wanting, the sacrament will itself justify him. On this showing it is a mistake to suppose, as is often done in popular controversy, that Rom. Catholics ascribe to the sacramental rites such magical or talismanic power that those rites can sanctify even an unrepentant sinner. Their efficacious operation, it is held, *presupposes as conditions* the repentance and other moral dispositions of the recipient, though the grace which they give *is due, not to these dispositions, but to the sacraments as received with such dispositions*.



Or.

OR, n. *ŏr* [F. *or*, gold—from mid. L. *orum*—from L. *aurum*, gold]: in *her.*, gold, which is expressed by engraved small dots.

OR, conj. *ŏr* [contracted from AS. *âther*, or, either: Icel. *eda;* Fris. *auder;* Dut. *odder*, or]: a particle that marks an alternative; the correlative of *either*. OR EVER, before: AD. [a corruption of AS. *aer*]: in *OE.*, ere; before; sooner than.

ORACH, or ORACHE, *ŏr'ăk*, or ARRACH, *ăr'ăk* [F. *arroche*, mountain spinach: perhaps a mere corruption of *Atrĭplex* —fr. L. *ater*, black; *plexus*, twisted], (*Atriplex*): genus of plants of nat. order *Chenopodiaceæ*, having male, female, and hermaphrodite flowers; the male and hermaphrodite flowers with a 3–5-partite calyx, and 3–5 stamens; the female flowers with a compressed and 2-lobed or 2-partite calyx. The species are numerous. Some are frequent in waste places, and as weeds in gardens in Europe. GARDEN O. (*A. hortensis*), called also MOUNTAIN SPINACH, was formerly much cultivated in England, and is still cultivated in parts of Europe as a substitute for spinach. It is a native of Tartary, an annual, with stem about three ft. high, and cordate-triangular leaves which are thick and glaucous and have slightly acid flavor. The leaves are sometimes greenish, sometimes reddish, which is the case also in other species, and the flowers resemble the leaves in color.—The leaves of the Sea O. (*A littoralis*), native of the British coasts, are used in the same manner, and those of the common garden-weeds *A. patula* and *A. angustifolia*, are excellent substitutes for spinach.—It is mentioned in Remy and Brenchley's *Journey to the Salt Lake City*, that an orach, with pale pink leaves and a salt taste, is cultivated by the Indians on the Humboldt river for its seed, which resembles that of Quinoa (q.v.) and is used like it for making porridge and bread.

Orache patula.

ORACLE, n. *ŏr'ă-kl* [F. *oracle*—from L. *orāclum* and *ora'culum*, counsel from the gods—from *oro*, I plead, I pray: It. *oracolo*]: among the *ancients*, an announcement from the gods in answer to some inquiry; a prophetic declaration; the deity who was supposed to give the answer, also the place where given (see below): any one famed for wisdom and accuracy of opinions; a sentence or decision of great authority from its wisdom. **ORACLES**, n. plu. *ŏr'ă-klz*, divine revelations and messages; the holy Scriptures. **ORACULAR**, a. *ō-răk'ū-lėr*, resembling an oracle; pretending to have the authority of an oracle; grave; venerable; ambiguous. **ORAC'ULARLY**, ad. *-lĭ*. **ORACULOUS**, a. *ō-răk'ū-lŭs*, uttering oracles; resembling oracles; authoritative; ambiguous. **ORAC'ULOUSNESS**, n. *-nĕs*, the state of being oracular. **ORAC'ULOUSLY**, ad. *-lĭ*.

OR'ACLE: response of a deity or supernatural being to a worshipper or inquirer; also the deity responding; also the place of the delivery of the response. Such responses were supposed to be given by a certain divine afflatus, either through means of mankind, as in the orgasms of the Pythia, and the dreams of the worshipper in the temples; or by its effect on certain objects, as the tinkling of the caldrons at Dodona, the rustling of the sacred laurel, the murmuring of the streams; or by the actions of sacred animals, as exemplified in the Apis or sacred bull of Memphis, and the feeding of holy chickens of the Romans. This arose, in fact, from the idea that the deity signified his intentions to men by signs or inspirations, which, however, had always to be interpreted to the inquirer by the priesthood. Such responses were closely allied to augury, which differed in this respect that auguries could be taken anywhere, while the oracular spots were defined and limited. Oracle dates from the highest antiquity, and flourished in the most remote ages, and gradually declined with increasing knowledge. Among the Egyptians all temples were probably oracular, though only a few are mentioned as such by Herodotus; e.g., the oracle of Latona, in the city of Buto; those of Hercules, Mars, Thebes, and Meroe. In the hieroglyphic texts the gods speak constantly in an oracular manner, and their consultation by the Pharaohs is occasionally mentioned. In later days the most renowned of these oracles was that of Ammon, in the Oasis (q.v.), where oracular responses were rendered either by the shaking of the statue of the god, or by his appearance in a certain manner. Oracles were used by the Hebrews, also as in the consultation of the Urim and Thummim by the high priest, and the unlawful use of Teraphims, and consultations of the gods of Phœnicia and Samaria. The Hebrew oracles were by word of mouth, as the speech of God to Moses, dreams, visions, and prophetical denunciations; besides which, there were oracles of idol gods in Phœnicia, as that of Beelzebub and others of the Baalim. They were in use throughout Babylonia and Chaldæa, where the responses were delivered by dreams given to the priestesses, who slept alone in the temples as concubines of the gods. So numerous were the oracles in the ancient world, that 300 are said to have been in operation.

The most celebrated oracles of Asia Minor were those of Telmissus in Caria or Lycia, which gave responses by dreams, and that of Apollo at Patara; but the Grecian oracles had highest reputation for truthfulness; and the most celebrated of these were the Dodonean, the Delphic, and that of Trophonius and Amphiaraus. The Dodonean (see DODONA) was the only O. in Greece given by Jupiter; the others were either those of Apollo, or of certain soothsayers, to whom that god had imparted the gift of prophecy, or of other gods. The most renowned of all was the Delphic O. (see DELPHI), and was Panhellenic or open to all Greece, consulted for public purposes, and occupying a position resembling in some respects that of the papacy in the middle ages in Europe. The name of the first priestess who gave oracles was Phemonœ. The consultations were generally in the Delphic month, *Bysios* or April, and once a day on other months; and the precedence of consulting the oracle was determined by lot, but rich presents obtained for Crœsus and the Lydians the privilege of first consultation. Sacrifices were offered by the inquirers, who walked with laurel crowns on their heads, and delivered in sealed questions; the response was deemed infallible, and was usually dictated by justice, sound sense, and reason, till the growing political importance of the shrine rendered the guardians of it fearful to offend, when they framed the answers in ambiguous terms, or allowed the influence of gold and presents to corrupt the inspirations. The other oracles of Apollo were at Aba in Phocis; at Ptoon, where a man prophesied, which was destroyed in the days of Alexander the Great; and at Ismenus, s. of Thebes, Hysia, Tegyra, and Eutressis. In Asia Minor the most celebrated was that of Branchidæ, close to Miletus, celebrated in Egypt, Gryneum, and Delos. Besides that of Dodona, Zeus had another at Olympia; and those of various other deities were elsewhere. A secondary class of oracles of heroic or prophetic persons was in Greece, the two most celebrated of which were those of Amphiaraus and Trophonius. The first mentioned, one of the five great oracles in the days of Crœsus, was at Oropus, in Attica, being the shrine of a deified magician, or interpreter of dreams, having a fountain close to it. Those who consulted it, fasted a whole day, abstained from wine, sacrificed a ram to Amphiaraus, and slept on the skin in the temple, where their destiny was revealed by dreams. That of Trophonius was at Lebadea, in Bœotia, and owed its origin to a deified seer. It was given in a cave, into which the votary descended, bathed, and anointed, holding a honeyed cake. He obtained a knowledge of futurity by what he saw or heard, and returned dejected from the cavern. Then, seated upon the seat of Mnemosyne, he gave an account of what he had heard, and when conducted to the chapel of Good Fortune or Good Genius, recovered his usual composure. There were some other oracles of minor importance. Besides these oracles, written ones existed of the prophecies of celebrated seers, as Bacis and Musæus, which were collected by the Pisistratidæ, and kept in the Acropolis of Athens. Those of the Euclus, Panolmus, and Lycus also were celebrated. Others of the Sibyls or prophetic women, daughters of Zeus and Lamia, were popular, and at a later period (see SIBYLS), Athenais and others, prophesied in the days of the Seleucidæ.—Among the oriental nations, as the Arabs and others, divination was and is extensively practiced, but there are no set oracles. The Celtic Druids are said to have delivered responses, and the O. of the Celtic god Belenus or Abelio, in the Isle de Sein, was celebrated. Herodot. *Hist.* v. 89, viii. 82; Curtius, iv. 7; Hare, *Ancient Greeks* (12mo, Lond. 1836, p. 141); Bos, *Antiquities of Greece* (1823, p. 31).

ORAL, a. *ō'răl* [F. *oral*—from L. *orālis;* It. *orale*, oral—from L. *os*, the mouth—gen. *oris*]: uttered by the mouth or in words; spoken, not written. ORALLY, ad. *ō'răl-lĭ*, by mouth; in words, not in writing.

ORAN, *ō-rân'* (Arab. *Waran*): thriving municipal town and seaport of Algeria, cap. of the province of O.; at the inner extremity of the Gulf of O. 220 m. w.s.w. of Algiers.—The *province* of O., sometimes called the province of the West, as forming the w. frontier of the country, is bounded n. by the Mediterranean, e. by the province of Algiers, w. by the empire of Morocco, s. by the desert; about 100,000 sq. m., of which 13,514 belong to the Tell (q.v.), and a large portion to the Sahara. Besides the commune of O., there are in the province the communes of Sidi-bel-Abbès (q.v.), of Mostaganem (pop. 13,000), of Mascara (pop. 6000), and of Tlemcen (q.v.) Pop. of province (1881) 767,322, four-fifths Arabs.

The *town* of O. is the seat of the govt. offices—the prefecture, the civil, criminal, commercial tribunals, etc. It contains a college, primary and native schools, Prot. and other churches; synagogues; mosques; a branch of the bank of Algeria; exchequer, post, and telegraph offices; three great barracks, St. Philippe, le Château-Neuf, and le Château-Vieux; a milit. hospital, with accommodation for 1,400 beds (an immense new building, which overtops all surrounding edifices), and various splendidly appointed magazines and govt. stores. The town, girt by walls, and defended by strongly armed forts, is at the foot of a high mountain, crowned by the forts Santa-Cruz and Saint-Gregoire. The port does not offer safe anchorage; though it has been much improved in recent years. Large vessels, however, have still to find shelter in the roadstead of Mers-el-Kebir, three m. distant. The streets and promenades of O. are generally spacious, the houses elegant and airy. The principal edifices are the Château-Neuf, residence of the gen. of division; the Hôtel de la Préfecture; the great mosque de la Rue Philippe; the Rom. Cath. church; and the barracks. Pop. of commune, comprising the three suburbs, Mers-el-Kebir, La Senia, and Aïn-el-Turk (1881) 58,530. The country in the vicinity is bare and arid, though the land is not sterile. S. of the town the country is uncultivated; but toward the s. e., highly cultivated lands are seen. In the vicinity are many farms under the highest culture, most of them well furnished with buildings. Cattle are reared, and grain, tobacco, and cotton are grown. The vine already covers large tracts and its cultivation is annually extending. The wines are of good quality.

The *town* of O. was built by the Moors. It was taken by the Spaniards 1509, by the Turks 1708, again by the Spaniards 1732. It was destroyed by an earthquake 1791, and shortly afterward it was altogether abandoned by the Spaniards. O. was taken by the French 1831, has since remained in their hands, and has by them been developed into a large and prosperous town. Vessels with aggregate tonnage of 65,000 tons enter and clear the port yearly. The annual imports amount to about $6,355,422, and the exports to $1,268.411. A bishopric was established at O. 1867. Pop. of town (1881) 58,530; commune (town and suburbs) 59,377. In 1876 about one-fourth of the pop. was French.

ORANG, n. *ō răng′*, or ORANG-OUTANG, n. *ō-răng′û-tăng* [Mal. *orang-utan*, meaning wild man of the woods—from *orang*, man; *utan*, a wood], (*Simia satyrus*, or *Pithecus satyrus*, or *P. Abelii*): species of ape in the forests of Malacca, Conchin-China, and some islands of that part of the world; approaching in appearance the human form. The name is sometimes extended to include all the species of the restricted genus *Simia* or *Pithecus*, a genus which exists only in s.e. Asia and the Eastern Archipelago; and it was also till of late extended even to the African apes now forming the genus *Troglodytes*, the species which is the subject of this article being distinctively called the RED O., when it and the Chimpanzee were the only *anthropoid* apes known. The genus *Simia* or *Pithecus* differs from *Troglodytes* (the Chimpanzee and Gorilla) in the more lengthened muzzle—the lower part of the face projecting suddenly and remarkably; in the very large canine teeth; in the great breadth of the central incisors; and in the great length of the arms, which are so long that the fingers can touch the ground when the animal stands erect. The ears are small, and close to the head. The eyes are close together; the nose is little elevated; the lips are scarcely visible when the mouth is shut. The apes of this genus are arboreal in their habits, and not gregarious. They are ill adapted for walking on the ground, and in a wild state probably almost never assume an erect posture, and though they can be taught to do it in confinement, they maintain it with difficulty, and only when standing still; even then often seeking to adjust the balance of the body by raising the arms above and behind the head. In climbing and swinging among the branches of trees, the hands of the hinder extremities are used as readily as those of the anterior, and the great length of the arms is useful in enabling them to take hold of distant branches. The fingers of all the extremities are very long.

For some of the most important distinctions between the anatomy of the anthropoid apes and that of man, see CHIMPANZEE. The O. and its congeners are regarded as differing more widely from man in their anatomical characters than the chimpanzee and gorilla; though the number of ribs is the same as in man, and there are a few other particulars in which the O. more nearly resembles a human being than any of the African apes. The projecting muzzle is much less notable in the young than in the adult O., and the aspect of the adult males is further rendered hideous by great callosities on the cheeks. In the adult state, the ridges of the skull also greatly increase in thickness and prominence.

Orang-Outang (*Simia satyrus*).

The species of this genus exhibit in much greater degree than those of *Troglodytes* an anatomical character common to many other apes and monkeys, a pouch in the throat, opening from the windpipe, and capable of being dilated with air at the pleasure of the animal. In the O., it branches into several subordinate pouches among the muscles of the throat. The use of this organ is not known. It does not appear to have any connection with the voice; and has been supposed, not very probably, to be of some service in leaping, by diminishing the specific gravity of the animal.

There are at least two other species of the genus besides that best known as the O., one of these being the great Pongo (q.v.) of Borneo (*S.* or *P. Wormbii*), and the other (*S.* or *P. morio*), also native of Borneo, of comparatively small size. The nat. history of these apes has not been thoroughly investigated; and, until recently, it was supposed that the species first known might be identical with the great ape believed to exist in the woods, and that the differences of size and other characters might depend merely on age. The O. is about three ft. in length from the heel to the crown of the head. It is covered with brownish-red hair, which, on the back and arms, is five or six inches long, but very short on the backs of the hands and feet. There is little hair on the face, and none on the palms of the hands. When taken young, it is easily tamed, and becomes familiar. It has considerable sagacity, and some playfulness and love of mischief, but is not so frolicsome as many of the monkey tribe. Young specimens have sometimes been brought to Europe, but none have lived long. The temper is believed to change very much to the worse, when the animal reaches maturity.

ORANGE, n. *ŏr'ĕnj* [It. *arancio;* Sp. *naranja*, an orange—from Ar. *naranj*, an orange: mid. L. *arangia*, an orange, which passed into OF. *orenge;* F. *orange*, under the influence of the color of the fruit]: name of a tree, a species of citrus, and its fruit (see below): **Adj.** pertaining to or resembling the color of an orange. **Orange-colored**, a. of the color of an orange (see **Orange Colors**). **Orange-tawny**, a brownish orange color. **Orangeade**, n. *ŏr'ĕnj-ād'*, a drink made with orange-juice. **Orange-musk**, a species of pear. **Orange-peel**, the rind or skin of an orange. **Orangemen**, n. plu. *ŏr'ĕnj-mĕn*, famous political association of Protestant Irishmen—so called from William, Prince of Orange, who became William III. (see **Orangeman**). **Orangeat**, n. *ŏr'ăn-zhăt* [F.—from *orange*]: candied orange-peel. **Orangery**, n. *ŏr'ĕnj-ér-ĭ*, a house where oranges are reared artificially; a plantation of orange-trees. *Note.*—The proper spelling of **Orange** is *norange*, and in F. the spelling should be *narange*, but the word was early corrupted to *orange*—from F. *or;* mid. L. *orum*, gold, this being the color of the fruit.

ORANGE, *ŏr'ĕnj:* city in Essex co., N. J.; on the Delaware Lackawanna and Western, the New York and Greenwood Lake, and the Watchung branch of the Erie railroads; 13½ m. w. of New York, 3½ m. n. of Newark. It is on a series of ridges that rise gradually from a level of 150 ft. above tide-water and terminate in the Orange Mountains, more than 600 ft. above tide-water. O. and its suburbs, E. O., W. O., and S. O., are noted alike for healthfulness and beauty of location, and each has been improved and built up chiefly by New York business men who have made their homes here. The attractions of the vicinity are numerous and popular, and include excellent drives along and across the two ridges of mountains; the magnificent Llewellyn Park, which extends from the base to the summit of the mountain, includes nearly 1,000 acres of field, mountain, and woodland, and contains many beautiful residences; Eagle Rock, at the summit of the mountain, from which is presented a grand view of the country for many miles and of the cities of New York and Brooklyn, and a water panorama as far as the New York 'Narrows;' and the historic Hutton Park, now the headquarters of the Essex co. Country Club, widely known for its hunts. The Oranges combined have more than 50 m. of Telford and Macadam thoroughfares, and are connected with each other and with Newark by street railroads, operated by horses (1890, Oct.), but being prepared for the overhead electric system. The O. water-works, comprising an artificial reservoir between the two mountains, 29 m. of pipe, and 165 hydrants, and opened for use 1883, Oct. 1, are designed to supply all the Oranges, and Maplewood, Wyoming, and Milburn. O. proper was divided (1890, Oct.) into four wards; had 1 national bank (cap. $150,000), savings and half-dime savings banks, and 1 daily, 5 weekly, and 2 monthly publications; and contained a high school, and 4 grammar schools, memorial hospital, dispensary for the poor, training school for nurses, orphans' home, public library, board of associated charities, music hall, and Lincoln Hall. There were 16 churches (Presb. 4, Prot. Episc. 3, Bapt. 3, Rom. Cath. 3, Congl. 1, Meth. Episc. 1, New Jerusalem 1), and 2 organizations without edifices (Jewish and Unitarian). Pop. (1870) 9,348; (1880) 13,207; (1885) 15,231; (1890, census first report) 18,774.

ORANGE, *o-rŏngzh'* (anc. *Arausio*): ill-built, decaying, and dirty, but also interesting town of France, dept. of Vaucluse, in a plain on the left bank of the Aigue, 16 m. by railway n. of Avignon. Pop. 6,000. Its chief manufactures are silks, muslins, serges, etc.; and there are numerous oil-works, dye-works, and tanneries. It has considerable trade in wine, spirits, oils, truffles, saffron, honey, madder, and essences.

O. was cap. of the small independent principality of O. (now comprised in the dept. of Vaucluse), which was ruled by its own sovereigns from the 11th to the 16th c. The last of these sovereigns, Philibert de Chalons, died 1531, without issue. His sister, however, had married a Count of Nassau, and to that House the estates and titles passed. The Count of Nassau who obtained the principality of O. was William, father of William I., the Stadtholder of the United Provinces (see WILLIAM, PRINCE OF O.). William III., Prince of Orange and King of England, having died 1702 without issue, there began a long controversy as to the succession between Frederick I. of Prussia (as grandson of one of the last princes of O.), representative of the older branch of the House of Nassau (q.v.), and the head of the younger line. At the peace of Utrecht (1713) the king of Prussia took the settlement into his own hands, so far as the territory of O. was concerned, by making it over, for certain equivalents, to the king of France. The title, Prince of O., remained with the younger Nassau line, afterward kings of the Netherlands, and is now borne by the heir-presumptive to the Dutch throne.

In the vicinity of O. are several notable Roman remains. The triumphal arch, 60 feet high, is celebrated for the beauty of its architecture, and for its richly sculptured *bassi-rilievi*. Of the theatre, the remains are sufficiently entire to give a good idea of the arrangements of this institution among the Romans.

OR'ANGE: name of one or more species of *Citrus* (q.v.), a tree whose fruit is much prized. Botanists generally regard all the oranges as of one species, *Citrus aurantium*, but some follow Risso in making the Sweet O., the Bitter O., the Bergamot O., etc., distinct species. The wild state of the O. is not certainly known, though its characters may be with some confidence inferred from the degeneration of cultivated varieties; and no cultivated plant shows greater liability to degenerate, so that seedling oranges are almost always worthless. Its native country is not known, though there is reason to believe that all the kinds have spread from the warmer central and e. parts of Asia. It has been alleged that the O. is a native of N. America, near the Gulf of Mexico; but the probability is that it was introduced and has become naturalized there.

The COMMON O., or SWEET O. (*Citrus aurantium* of Risso), is an evergreen tree of moderate size, with greenish-brown bark; leaves oblong, acute, sometimes minutely serrated, leaf-stalks more or less winged, flowers white, fruit roundish, oil-cysts of the rind convex, juice sweet and acid. It is cultivated in almost every part of the world of which the climate is warm enough, but thrives best in the warmer, temperate, or sub-tropical climates, as in s. Europe, where it is extensively cultivated as far n. as s. France. The O. seems to have been unknown to the Greeks or Romans, but was probably brought to Europe by the Moors, and is supposed to have been introduced into Italy so recently as the 14th c., fully 1,000 years after the citron. In n. Italy, oranges are sometimes grown in conservatories, but often in the open air, except during winter, when they are covered with temporary houses of boards. In s. England, they are sometimes in like manner grown in the open air, with a shelter of boards or matting in winter, but trained against a south wall; attaining large size, and yielding good fruit; but they are thus cultivated merely as objects of interest. In former times, when the evergreen shrubs in cultivation were much fewer than now, O. trees were more frequently cultivated in pots, in green-houses and in windows in the more northern temperate countries, as is still the case in n. Germany. The O. loves rich soil; and has been said to thrive in a strong clay, though American growers deny this. There are many varieties in cultivation in different countries, perpetuated by grafting upon seedling O. stocks, and by layers. In this country, budding is one of the leading methods of propagating the O.—probably used more extensively than grafting and layering combined.

Of varieties of Sweet O., perhaps the most deserving of notice are the PORTUGAL or LISBON O., most common of all, having the fruit generally round or nearly so, and a thick rind; the CHINA O., said to have been brought by the Portuguese from China, now much cultivated in s. Europe, having a smooth thin rind and very abundant juice; the MALTESE or BLOOD O., remarkable for the blood-red color of its pulp, the EGG O., having fruit of an oval shape; and the TANGERINE O., having a small flat fruit, with extremely aromatic odor and mildly flavored pulp, not abundant in juice. There are two varieties; the smaller hardly an inch in diameter, with sweet flesh and deliciously fragrant rind; the larger about half the size of the common O.: the smaller is rarely seen in this country. The ST. MICHAEL'S O. appears a sub-variety of the China Orange. The MAJORCA O. is seedless, like certain cultivated varieties of other fruits.

The BITTER O., SEVILLE O., or BIGARADE (*Citrus vulgaris*, or *C. bigaradia*), is distinguished from the Sweet O. by the more truly elliptical leaves, the acid and bitter juice of the fruit, and the concave oil-cysts of its rind. Also its branches are spiny, which is rare with the Sweet Orange. The varieties in cultivation are numerous. The Bitter O. was extensively cultivated, probably for medicinal purposes, by the Moors in Spain, especially around Seville (whence its name). The rind is more bitter than that of the Sweet O., and is used as a stomachic and tonic. Its chief use, however, is for flavoring puddings, cakes, etc., and for the confection called O. marmalade.

For the BERGAMOT O. (*C. Bergamia*), see that title.

The MANDARIN O., or CLOVE O. (*C. nobilis*), recently introduced from China, has fruit much broader than long, with a thick rind, very loosely attached to the flesh, so that there is often a space between them. The leaves are smaller than those of any other kind of orange.

The NAVEL O. from Brazil is nearly double the size of the ordinary O., and has a peculiar navel-like formation on the top of its somewhat oval fruit.

O. leaves are feebly bitter, and contain a fragrant volatile oil, obtained by distilling them with water, and known in the shops as *Essence de Petit Grain*. O. flowers yield, when distilled with water, a fragrant volatile oil, called *Oil of Neroli*, used in making *Eau de Cologne*, and for other purposes of perfumery. The flowers both of the Sweet O. and of the Bitter O. yield it, but those of the Bitter O are preferred. Dried O. flowers, to be distilled for this oil, are an article of export from s. Europe. They are packed in barrels, and mixed with salt. The dried flowers have a yellowish color; the fresh flowers are white and very fragrant. The use of them as an ornament in the head-dress of brides is common throughout great part of the world.—The small green oranges, from the size of a pea to the size of a cherry, which fall from the trees, both of the Sweet O. and the Bitter O., when the crop is too great to be brought to maturity, are carefully gathered and dried, and are the *O. berries* of the shops. They are used in making Curaçoa, and they yield a fragrant oil on distillation, the original *essence de petit grain;* and they are smoothed in a turning-lathe, and employed in surgery as *issue pease;* not readily acquiring a fetid odor, as pease do when employed for this purpose.—The dried and candied rind of the ripe Bitter O., well known as *Orange-peel*, is used as a stomachic, and for flavoring puddings and confectionery. The rind of the Sweet O. sometimes employed in the same way, is inferior. A fragrant essential oil is obtained from the rind of the O. by distillation with water, and is sold by perfumers as *Oil of Sweet O.*, or *Oil of Bitter O;* the two kinds are very similar. The rind of the O. is used in preparation of a fine liqueur, *O. Rosoglio*, an article of export from parts of Italy. The juice of the Sweet O. is valuable in febrile diseases.

O. trees are often extremely fruitful, so that a tree 20 ft. high, occupying a space little more than 12 ft. diameter, sometimes yields 3,000 to 4,000 oranges in a year. The tree attains an age of 100 to 150 years, perhaps more. Young trees are less productive than old ones, also the fruit is less juicy, has thicker rind, and more numerous seeds. The wood is yellowish white and close grained: it is used for inlaying and for turnery.

The fruit of the O. tree is of great commercial importance; as no fresh fruit has in the same degree as the O., and its congeners, the lemon, citron, lime, etc., the property of being easily packed in boxes, when nearly ripe, and in that state enduring the close confinement of a ship's hold during a voyage of two or three weeks.

In the United States the O. supply is from the Mediterranean coast, or from Havana or its vicinity; and latterly from Fla., and s. Cal. and some other states, in which the culture has become widely extended and a source of great profit. The imports of oranges for year ending 1888, June 30, were valued at $1,403,515.

In a favorable climate the O. thrives on a wide variety of soils from high pine barrens to a low moist field, but not in heavy clay. Frosts are injurious, and if severe may prove fatal to the trees. Where light frosts are likely to occur sheltered locations for the trees should be selected. Trees may be started from the seed or obtained from a wild grove or a nursery. When grown from seed the quality of the fruit is likely to degenerate. Budding on wild stocks not only keeps the variety pure but gives more hardy trees than are produced from seed of the sweet sorts. Budding also induces early bearing. Wild groves are sometimes thinned and the remaining trees budded or grafted. When a grove is to be started the land should be plowed and the young trees set in rows about 30 ft, apart each way. This will give 48 trees per acre. Much closer setting (20 ft. apart and giving over 100 trees per acre, is sometimes practiced, but when grown the trees do not have sufficient room. While the trees are small vegetable crops may be grown among them but these crops should be freely manured. The budded trees may be taken from the nursery when four years old. If well cared for they should yield fruit in four or five years after setting, and become quite productive in 10 or 15 years. Annual crops may be expected but in some seasons the yield will be greater than in others. From 2,000 to 5,000 oranges per tree may be considered a good yield but some old trees produce 10,000 oranges each. The roots of the trees grow near the surface; consequently cultivation should be shallow. Fertilizer, of any standard kind, lightly worked into the soil will be highly beneficial. Insect enemies should be kept down by the use of a kerosene emulsion, or other insecticide, and by clean cultivation. The bearing season in this country extends, for the main crop, from Nov. to Feb. in La., Dec. to March in Fla., Feb. to May in Cal. Besides several varieties of the Mandarin O., of which the King and the Satsuma are leading kinds, and a few varieties of the Tangerine O., there are a large number of sorts of the sweet O. Among popular kinds are the Cunningham, Exquisite, Foster, Jaffa, Mediterranean Sweet; Tardiff, known also as Hart's Late; Washington Navel, also known as Bahia, and Riverside Navel, and Whitaker. Some of these varieties are native seedlings; others were introduced from foreign countries by the national govt., nurserymen, or fruit-growers. The quality is greatly dependent on climate. Very mild-flavored sorts become worthless in Fla., and the acid kinds become too sour when grown in Cal. The Fla. crop (1889) was about 1,600,000 boxes; the Cal. crop about 900,000 boxes. There are 120 to 150 oranges in a box.

Oranges, gathered for export, must not be quite ripe; those fully formed, and with color just turning from green to yellow, are chosen. Each is wrapped in a piece of paper, or in the husk of Indian corn, and they are packed in boxes and half-boxes, chests and half-chests. *Orange-peel* for confectionery is carefully separated, either in halves or quarters, from the fruit and after lying in salt-water for a time, is washed in clear water, and then boiled in syrup of sugar, or candied. The rinds of the citron and lemon are treated in the same manner.

OR'ANGE COL'ORS, for Painters' Use: various shades of alteration produced on chrome yellow (see YELLOW), by acting on it either with diacetate of lead or a weak alkaline lye, both of which redden the otherwise pure yellow, and give it an orange tint. For dyers a beautiful orange red is obtained from safflower; and orange yellows are made by mixing, in proper proportions, any of the red with the yellow dies.

ORANGEMAN: unhappy party designation which for more than a century has contributed to keep alive religious and political divisions of the worst character in the British empire, especially in Ireland. The Orange organization had its origin in the animosities which had subsisted between Protestants and Rom. Catholics in Ireland since the Reformation, but which reached their full development after the Revolution of 1688, and the wholesale confiscations of Rom. Cath. property by which that event was followed. From that time the Rom. Catholics of Ireland may be said legally to have lost social, political, and religious status in their own country. Some attempts in the latter part of the 18th c. to ameliorate their condition, excited, especially in the north, the alarm of the Prot. party, who regarded the traditionary 'Protestant ascendency' as endangered. Acts of violence became frequent, and, as commonly happens, combinations for aggressive and defensive purposes were formed by both parties. The members of the Prot. associations appear at first to have been known by the name of 'Peep-of-day Boys,' from the time at which their violences were commonly perpetrated; the Rom. Catholics who associated together for self-defense being called 'Defenders.' Collisions between armed bodies of these parties were frequent. In 1785, a pitched battle, attended with much bloodshed, was fought in the county of Armagh. Attempts at repression of open violence were inefficient, yet had the effect of diverting the current into the more dangerous channel of secret associations. The rude and illiterate mob of Peep-of-day Boys made way for the rich and influential organization of the Orange Society, which by degrees extended its ramifications into every portion of the British empire, and into every grade of society from the hovel to the very steps of the throne. It was named from the Prince of Orange, William III. (q.v.), who, in Ireland, has been popularly identified with the establishment of the Protestant ascendency. The first 'Orange Lodge' was founded in the village of Loughgall, county Armagh, 1795, Sep. 21. It was a region and time of outrage, 12 or 14 houses of Rom. Catholics being sometimes, according to a disinterested witness, wrecked in a single night. The assoc. which began among the ignorant peasantry soon worked its way upward. The general disaffection toward English rule, which at that time pervaded Ireland, and in which the Rom. Catholics, as a natural consequence of their oppressed condition, largely participated, tended much to identify in the mind of Protestants disloyalty with popery; and the rebellion of 1798 inseparably combined the religious with the political antipathies. In Nov. of that year, the Orange Society had already reached the dignity of a grand lodge of Ireland with a grand master, a grand secretary, and a formal establishment in the metropolis; and in the following years, the organization extended over the entire province of Ulster and had its ramifications in all the centres of Protestantism in the other provinces of Ireland. In 1808, it extended to England. A grand lodge was founded at Manchester, from which warrants were issued for the entire kingdom: its seat was transferred to London 1821. Memorable in the history of the Orange Soc. was the election of a royal duke (Cumberland) 1827 as grand master for England, and 1828 as imperial grand master. The Rom. Cath. Relief Act of the following year stirred up all antipathies of creed and race, and emissaries were sent out to organize lodges in Wales, Scotland, Canada, the Mediterranean region, and in the other colonies. A formidable part of this zealous propagandism was its introduction into the army, discoverable 1824 and 26. No fewer than 32 regts. were proved to have received warrants for holding lodges in Ireland, and the English grand lodge had issued 37 warrants for the same purpose.

The organization was complete and extensive. The only condition of membership was, that the applicant should be Prot., and 18 years of age. In 1835, the association numbered 20 grand lodges, 80 district lodges, 1,500 private lodges, and 200,000 to 220,000 members. Its worst effect was its supply of a constant incentive to party animosities and deeds of violence. The spirit of fraternity which pervaded its members was a standing obstacle to the administration of the law; and confidence in the local administration of justice by magistrates was destroyed. An alleged Orange conspiracy to alter the succession to the crown in favor of the Duke of Cumberland, led to a protracted parliamentary inquiry 1835; and this inquiry, as well as a shocking outrage by an armed body of Orangemen, on occasion of a procession in Ireland, so discredited the association, that its respectability has since gradually diminished. For several years the lord chancellor laid down a rule, by which no member of the Orange Assoc. was admitted to the commission of the peace; and the association became comparatively without influence, except among the very lowest classes in n. Ireland. Of the colonial offshoots of the Orange Assoc., those of Canada have at all times been most active, and outrages against Rom. Cath. churches and convents were frequent until recent years; and on occasion of the visit of the Prince of Wales to Canada, an attempt was made to force from his royal highness a recognition of the assoc., which was defeated by his own firmness, and by the judicious counsels of his advisers. A few years ago the Orangemen of British America constituted above 1,200 lodges, with about 150,000 members. The assoc. has branches in the United States also.

The Orange Assoc. in Ireland which had begun to fall into general disrepute, received an impulse among the working-classes from a series of sanguinary conflicts with Rom. Catholics on occasion of the anniversary celebrations of the society; and even still, the peace of many districts in n. Ireland is preserved on such occasions only by the presence of an overpowering force of military and constabulary. The repeal of the Processions Act has failed, till the present time, to put an end to the traditional collisions of the parties.

OR'ANGE RIV'ER, South Africa: see GARIEP.

OR'ANGE RIVER FREE STATE: name assumed by the republic of Dutch boers, who, after retiring from Natal when it was declared a British colony, established themselves in the country between the two great branches of the Orange river, the Ky Gariep and the Gariep, known to the colonists as the Vaal and Orange rivers, and separated from the coast region by the great chain of the Quathlamba, Maluti, and Drachenberg mountains; more than 60,000 sq. m. The state is a sort of connecting-link between the Cape Colony, the Transvaal, and Natal. It consists chiefly of vast undulating plains, which slope down from the Maluti Mountains to the Vaal river, dotted over with rocky hills, called 'Kopjies;' but in the n., hundreds of sq. m. have scarcely a break on the horizon. When the emigrant Dutch boers took possession of this country, it was inhabited by different tribes of Betjouanas and Corannas, all of whom have been dispersed or subdued, including the powerful Basuto tribe, under the late chief Moshesh. The country is very rich in minerals: precious stones occur; coal is found everywhere, and iron, tin, copper, and lead are plentiful; besides plumbago, alum, saltpetre, ochre, and useful earths. All the rivers of this region are affluents of either of the branches of the Gariep; among them are the Modder, Valsch, Great and Little Vet, which run into the Ky Gariep or Vaal river, and the Caledon, a considerable stream, which joins the Orange river after draining the Basutu country. This region is a vast plateau, rising 3,000 to 5,000 ft. above sea-level, with very little wood, except along the water-courses. Travellers crossing this state from the Cape Colony to Natal arrive at the top of the passes leading to the latter colony without a mountain being in sight, and then find themselves suddenly on the edge of an immense mountain chain, with the coast region several thousand ft. below them, extending to the Indian Ocean. Immense herds of the larger antelopes formerly tenanted these vast plains, and are vividly described by Captain Harris, Gordon Cumming, and others; they are now fast disappearing. The diamond-fields recently discovered lie partly in this state, partly in Griqualand West, now British territory.

The land in the Free State is very fertile. The difference of temperature in various parts of it renders it possible to raise tropical and sub-tropical products, coffee, sugar, rice, and cotton, in some parts; while hemp, flax, and the vegetables of n. latitudes grow freely elsewhere. Tobacco and maize are largely cultivated, and fruits can be had all the year round. The climate of the state is very healthful; and that of the uplands, considering the latitude, is wonderfully cool. The houses of most of the inhabitants are little more than strongly built mud huts, very sparely furnished.

The cap., Bloemfontein, is the only considerable town, and contained (1881) 2,567 inhabitants. The other villages or small towns are on the increase. The Dutch Reformed Church has about 20 congregations; the Anglican, Wesleyan, Lutheran, and Rom. Cath. Churches also are represented. There are 13 administrative districts in the state. The public income 1879–80 was stated at $520,379, the expenditure at $508,934.

The country forming the Orange River Free State was described by Capt. Harris before 1836, as a howling wilderness, inhabited by wandering hordes of Bushmen and broken tribes of Betjouana and Zulu refugees from the armies of the great Zulu tyrants, Chaka. Dingaan, and Maselikutse. After the Kafir war of 1835–6, dissatisfaction arose in the minds of many of the frontier boers, and an extensive emigration took place along the n.e. frontier of the Cape Colony; the majority of the emigrants having Natal as their ultimate goal. However, after the British govt. had declared Natal an English colony 1843, the boers again fell back on this region, and by degrees declaring their independence of the British crown, and forming a sort of Alsatia on the borders of Natal after some opposition, and one or two conflicts with British troops, the country was annexed by Sir H. Smith to the British empire, under the name Orange River Sovereignty; and continued so until 1854, when Sir G. Clerk formally gave it up, and allowed the inhabitants to form a govt. according to their own wishes. The govt. is now in the hands of a president, freely elected by the landrost and heemraden in the several districts; while the volksraad, or peoples' council, exercises legislative functions. This state labors under the very serious disadvantage of being, like the kingdom of Bohemia, entirely inland, and has no port on the ocean at which customs dues can be collected; thus throwing the whole of the expense of govt. on local taxation.

About 1862, a large number of Griquas—a tribe of Bastard Hottentots, who inhabited the s. part of the state—sold their farms to the Free State govt., and migrated in a body to the coast side of the mountains in Independent Kaffraria, occupying a large tract of country there known by the name of No Man's Land.

In 1866, a treaty was concluded with Moshesh, chief of the Basutos, by which a portion of the territory known as Basuto Land was ceded to the O. R. F. S. The boundaries agreed on by this treaty were, however, somewhat modified by the gov. of Cape Colony 1869.

The Dutch boers profess the Dutch Reformed faith, and speak a dialect of Dutch, corrupted with Hottentot and English words. They marry young, and keep up, to some extent, nomadic habits. The roads and internal communication are good. Lime and timber are rather scarce, but building stone and thatch abundant. Wooled sheep have increased amazingly in the last few years; and farms that ten years ago would hardly fetch $250, now sell at $10,000 to $15,000. The value of imports is about $2,500,000 a year; of exports, $5,000,000. Pop. at the first census (1880) 133,518, of whom 61,002 were whites.

ORARIUM, n. *ō-rā'rĭ-ŭm* [L.]: a scarf worn by the classic nations to wave in the circus on triumphal occasions; also a napkin for the same use as a modern pocket-handkerchief: in *eccles.*, a scarf sometimes twined round the handle of the mediæval crosier; also the scarf or stole of a priest, or the border or hemming of a robe.

ORATION, n. *ō-rā'shŭn* [OF. *oration*—from L. *oratĭōnem*, speech, eloquence—from *oro*, I plead, I beseech: It. *orazione:* F. *oraison*]: a speech or discourse delivered in public on a special occasion; a harangue; a declamation. **Orator**, n. *ŏr'ă-tėr* [F. *orateur*—from L. *oratōrem*]: an eloquent public speaker. **Oratorical**, a. *ŏr'ă-tŏr'ĭ-kăl*, or **Or'ato'rial**, a. *-tō'rĭ-ăl*, pertaining to oratory; becoming an orator. **Or'ator'ically**, ad. *-lĭ*, or **Or'ato'rially**, ad. *-lĭ*. **Oratory**, n. *ŏr'ă-tėr-ĭ* [L. *oratoria*, oratory]: the art of speaking in public in a pleasing and effective style; an exercise of eloquence (see Eloquence: Rhetoric).—Syn. of 'oration': address; speech; lecture; sermon.

ORATIONES: see note under Preces.

ORATORIANS, *ŏr-a-tō'rĭ-anz:* members of the Congregation of the Oratory: see Neri, Philip de.

ORATORIO, n. *ŏr′ă-tō′rĭ-ō* [It. *oratorio*, an oratorio—from It. *oratorio*, chapel or oratory, the place where these compositions were first performed]: long sacred musical composition, either purely dramatic or partaking both of the drama and the epic, in which the text is illustrative of some religious subject, sometimes taken directly from Scripture; and the music consists of recitatives, airs, duets, trios, quartets, choruses, accompanied by an orchestra, sometimes also by an organ, and introduced by an instrumental overture. The O. is not intended for scenic representation.

St. Filippo Neri, b. 1515, has been considered the founder of the O. He engaged poets and composers to produce dialogues, on subjects from scriptural and legendary history, in verse and set to music, which were performed in his chapel or oratory on Sundays and church festivals. The subjects were *Job and his Friends*, *The Prodigal Son*, *The Angel Gabriel with the Virgin*, and *The Mystery of the Incarnation*. Stradella composed various oratorios, of which *San Giovanni Battista*, produced 1670, is praised by Dr. Burney. A number of oratorios, or *azioni sacre*, by Apostolo Zeno and Metastasio, were set to music by Caldara in the beginning of the 18th c. Sebastian Bach's *Passions-Musik* was a species of O., originally performed during the service of the church, the congregation joining in the chorales. Its form arose out of the practic in the Lutheran Church, of having the gospels for the day repeated on Good Friday, and some other festivals, by different persons in a recitative and dialogue style. By far the greatest master of O. was Handel, who perfected that species of composition, and was the first to introduce it into England. At the age of 20 when on a visit to Italy, he produced his O. *La Resurrezione* at Rome. *Esther*, the first O. written by him in England, was composed for the chapel of his patron, the Duke of Chandos, 1720, the words altered from Racine. It was performed privately at Cannons in the same year, but laid aside, and not produced in public till 1732, An O. was then so complete a novelty in England, that it was deemed necessary to give the following explanation in advertising it: 'By His Majesty's command, at the King's Theatre in the Haymarket, on Tuesday the 2d May, will be performed the sacred Story of Esther, an oratorio in English, composed by Mr. Handel, and to be performed by a great number of voices and instruments.—*N. B.* There will be no acting on the stage, but the house will be fitted up in a decent manner for the audience.' For many years after the appearance of *Esther*, no more oratorios were produced by Handel, who applied himself to operas and other secular music; and it was only after the temporary failure of his health, that at the age of 53 he turned again to O. The great oratories which have made his name immortal all were produced in the decline of life, some of them after he was afflicted with blindness, and they were performed mostly in the Old Haymarket Theatre. *Deborah* was performed first 1733; *Athaliah*, 1734; *Israel in Egypt*, 1738; *The Messiah*, 1741; *Samson*, 1742; *Judas Maccabæus*, 1746; *Joshua*, 1747; *Solomon*, 1749; *Jephtha*, 1751. The two crowning works were *Israel in Egypt* and *The Messiah*—the former ranks highest of all compositions of the oratorio class. *The Messiah*—which, because its text was entirely from Scripture, was called by Handel *The Sacred Oratorio*—ranks very near it in musical merit, and has attained a more universal popularity; from the time when it was first brought out, to the present day, it has been performed for the benefit of nearly every important charitable institution in Britain, and has been produced in the United States on many recurring anniversaries. *Judas Maccabæus* is pehaps best known from the flowing and martial grace of that unrivalled military march, 'See the Conquering Hero Comes;' and *Saul* is associated in every one's mind with the most solemn of all funeral marches. The orchestra was but imperfectly developed in Handel's time, and his oratorios had therefore originally but meagre instrumental accompaniments; they have since been generally performed with additional accompaniments written by Mozart. From Handel's time onward, it was the custom in London to have oratorios performed twice a week during Lent in the various theatres; this custom continued till the institution of the O. performances at Exeter Hall. Haydn composed three oratorios—*The Return of Tobias*, *The Seven Last Words*, and *The Creation*. *The Seven Last Words*, a work full of sweetness and of energy, hardly answers to the common conditions of an O.; it is rather a series of symphonies, intended to follow as many short sermons on the sentences uttered by our Lord on the cross, the text being a subsequent addition by the composer's brother, Michael Haydn. *The Creation* originated in a visit of Haydn to London 1791, when he heard for the first time some of the works of Handel, none of which were then known in Germany. Though less grand than the oratorios of Handel, it is full of fresh lovely songs, bright choruses, picturesque recitatives, and exquisite instrumentation. Beethoven's sole O., *The Mount of Olives*, is a pure drama rather than the mixed composition generally known under the name. Spohr's *Last Judgment*, produced 1825, contains some grand music, particularly in the choruses. Costa's *Eli* deserves mention among modern oratorios. But since the time of Handel no other writer of oratorios has approached Mendelssohn, whose greatest works are his *St. Paul* and *Elijah;* the former produced first at Düsseldorf 1836, the latter at Birmingham 1846. At his death he was engaged in a third O., called *Christus*, which he expected would be his greatest, and of which but a few fragments have been published. Mendelssohn greatly promoted the O. in Britain. Gounod's O., *The Redemption*, produced first at Birmingham 1882, he regards as his masterpiece. At Exeter Hall in London, and throughout England, oratorios are performed on a large scale, and with a power, a precision, and a perfection unknown elsewhere. The choruses at the provincial festivals are mostly supplied by Birmingham, Manchester, Leeds, and other large towns. The greatest O. performances are now those of the Triennial Festivals at the Sydenham Crystal Palace. At the festival of 1880, the chorus amounted to 2,900 voices, and there was an orchestra of 425 performers.

The first performance of O. in the United States was 1770, in Trinity Church, New York; but the first entire O. in New York was not till 1831—in both instances Handel's *Messiah*. The Handel and Haydn Soc. of Boston was formed 1815, and its first O. was in that year—Haydn's *Creation*, Part I. Selections from oratorios had been brought out often in concerts before that time, and the *Creation* entire was produced by the Handel and Haydn Soc. in King's Chapel, Boston, 1816. In 1821, the same O. was executed by the Baltimore Harmonic Soc. The New York Sacred Music Soc. from 1831 continued to give yearly oratorios. In 1837, the Boston Musical Institute, and the Acad. of Music there, began to render this class of works; 1844, the New York Musical Institute; 1849, three New York societies were fused into the Harmonic Soc. for the same purpose. In 1857, a new impulse was given by the first triennial musical festival of the Handel and Haydn Soc. of Boston, when three oratorios were produced. From 1863 onward, members of the New York Harmonic and other societies, including the Mendelssohn formed that year—but, most prominently, the New York Oratorio Soc. instituted under Dr. Damrosch 1873—have rendered the *Messiah* in Christmas week. Outside of these musical centres there have been many societies, with occasional O. performances—most systematically by the Worcester County Mus. Assoc., Mass., formed 1863. In the west, the German societies rarely present sacred music; it is left to the 'psalm-singing' American associations.

Among the composers of oratorios in the United States, more or less successful, are John K. Paine, author of *St. Peter*, 1872; J. Eliot Trowbridge, *Immanuel*, 1886; George Bristow, *Hymn of Praise;* Max Vogrich, *The Captivity*, 1890; and authors of sacred cantatas or 'short oratorios' such as *Belshazzar*, by J. A. Butterfield; *Belshazzar's Feast*, George F. Root, 1860, and his *Faith Triumphant*, 1886; *Esther*, Wm. B. Bradbury, 1874; *Daniel*, Root and Bradbury; *Fourth Psalm*, Dudley Buck; *Forty-sixth Psalm*, W. W. Gilchrist; *Biblical Cantata*, L. Damrosch, and his *Ruth and Naomi; Boaz*, Andrews; *Third Psalm*, J. E. Trowbridge; *Redemption Hymn*, J. C. D. Parker; *Praise to God*, G. Bristow; *Juvenile Oratorios*, J. C. Johnson; *Joseph in Bondage*, Chadwick; and *A Supplication*, P. F. Campiglio.

The cultivation of the O. in America is well illustrated by the wide range of performances of the Handel and Haydn Soc. of Boston—the largest and (the Stoughton Soc. excepted) the oldest existing organization in this country devoted to sacred music. Following its production of Haydn's *Creation* entire, 1816, may be mentioned Beethoven's *Mount of Olives*, 1833; Spohr's *Last Judgment*, 1842; Mendelssohn's *St. Paul*, 1843; *Samson*, and *Moses in*

Egypt, 1845; *Judas*, 1847; *Elijah*, 1848; *Solomon*, 1855; Costa's *Eli*, 1857; *Israel*, 1859; *St. Cecilia*, 1863; *Jephthah*, 1867; *Naaman*, 1869; *Woman of Samaria*, 1871; *Christus*, and Bach's *Passion*, 1874; *Joshua*, 1876; *Christmas Oratorio*, 1877; Berlioz's *Flight into Egypt*, 1879; Sullivan's *Prodigal Son*, 1879; Saint Saën's *Deluge*, 1880; Graun's *Death of Jesus*, 1882; Gounod's *Redemption*, Rubenstein's *Tower of Babel*, Paine's *Nativity*, Bruch's *Arminius*, 1883; Gounod's *Mors et Vita*, 1886. To 1879, the *Messiah* had been performed 68 times, the *Creation* 60, Neukomm's *King David* 57, *Moses in Egypt* 45, *Elijah* 43, *Samson* 33. See Grove's *Dictionary of Music* and appendix, and Ritter's *Music in America*, new ed. 1890.

ORATO'RIUM [Lat.; called in Greek, *eukterion* or *proseukterion*, as distinguished from *ecclesia* 'a church']: see ORATORY.

ORATORY, the art of an orator: see under ORATION: see also ELOQUENCE: RHETORIC.

ORATORY, n. *ŏr'ă-tėr-ĭ* [F. *oratoire;* It. *oratorio*, an oratory, a private chapel—from L. *ōrārĕ*, to pray]: apartment or building designed for worship private or domestic. From the earliest times, the use of oratories is traceable in the history of the church; and before the regular organization of parishes, they had probably a considerable place in the usual, though not in the public worship. At a later period, oratories became a common appendage of the castles and residences of the nobility, and were of two kinds; the first, simply for private or family prayer and other devotion; the second, for celebration of mass. The latter fell properly under the jurisdiction of the bishop or the parochial clergy, and many jealousies and disputes grew out of their establishment or direction. The Council of Trent (Sess. xxii., *De Reformatione*) placed them under very stringent regulations, which have been enforced and developed by later popes, especially by Benedict XIV.

OR'ATORY, CONGREGATION OF THE: learned congregation or body of priests in the Rom. Cath. Chh., founded by St. Philip de Neri (for its early history, see NERI, PHILIP DE). It is remarkable that this extraordinary man, unlike most other founders of religious bodies in the Rom. Cath. Church, had never committed to writing any definite body of rules for the government of the brethren. Even his scattered papers, from which his plans and intentions might have been collected, had been burned by his orders a short time before his death. Soon after that event, the Fathers, at the instance of Baronius, compiled from the existing practices and from memory a rule for the Congregation, framed so as to embody the spirit of St. Philip. This rule was approved of by Paul V. 1612, Feb. 21. The Fathers of the Congregation are a body of priests living in community, but without vows, and under a highly democratical constitution. They are at liberty to withdraw at any time, and to resume possession of the property which they had brought with them at entrance; and even during their association, each member manages his own financial concerns, only contributing a fixed sum to the common expenses of the community. There is no superior-gen. as in other orders. Each house is distinct and independent. In each, the superior is elected for only three years, and his position does not give him any personal pre-eminence whatever. The members take their places according to seniority, not according to official rank, and the superior is compelled to take his turn in all the duties, even down to the semi-menial office of serving in the refectory. The main occupations of the Fathers, beyond those of attending to the public service of the church, and the duties of the pulpit and the confessional, are in the cultivation of theological and other sacred studies, of which 'conferences' for discussion, in common, of theological questions, are a principal feature. The Congregation has produced many men of great eminence in sacred science, notably the great church historian, Cardinal Baronius, and his continuators. To these may be added the celebrated explorers of the Roman catacombs, Bosio, Severani, and Aringhi; and the no less eminent patristical scholar, Gallandi. The houses of the O. in Italy before the Revolution were numerous, and in high repute. The Congregation was early established in France by the celebrated Pierre (afterward Cardinal) de Berulle, in common with two Italian Fathers, and from France it extended to the Low Countries. One important difference, however, is noticeable between the French O. and the Roman original. In the French, all the houses of the country are subject to a single superior-general. In France, also, the Oratorians took charge of seminaries and of theological teaching. The French O., as well as the Italian, reckons many illustrious members; but the fame and utility of the French Congregation were much marred by the unhappy controversy about Jansenism. In 1847, this Congregation was introduced into England by Dr. John Henry Newman (q.v.). Soon after his secession from Anglicanism, he established a house, the members of which were for the most part ex-Anglicans like himself, near, and finally at Birmingham; and soon afterward, a second at London, since transferred to Brompton.

ORB, n. *ŏrb* [F. *orbe*—from L. *orbem*, a circle, a ring: It. *orbe*]: a circular body; any celestial sphere; in *OE.*, period or revolution of time; sphere of action; the eye: V. in *OE.*, to form into a circle. **Orbed**, a. *ŏrbd* or *ŏr'bĕd*, round; circular. **Orb-like**. a. in the form of an orb. **Orbicular**, a. *ŏr-bĭk'ū-lėr* [L. *orbic'ulāris*]: spherical; circular; made in the form of an orb; in *bot.*, having a rounded leaf with the petiole attached to the centre of it. **Orbic'ularly**, ad. *-lĭ*. **Orbic'ularness**, n. *-nĕs*, the state of being orbicular. **Orbic'ulate**, a. *-ū-lāt*, or **Orbic'ulated**, a. *-lā-tĕd*, made or being in the form of an orb; orbicular.—**Syn**. of 'orb, n.': ball; sphere; globe; orbit; circle; circuit; wheel.

ORBIS, n. *ŏr'bĭs*, or **Orb-fish** [L. *orbis*, a circle]: a fish of a circular form, found in the Indian seas.

OR'BIS PIC'TUS (the *Pictured World*) : title of the first picture-book or illustrated manual of instruction for the young, by the celebrated educationist, Comenius, pub. Nürnberg 1657. It was long a great favorite with the youth of Germany, and continued to be reprinted, in modified forms, till recent times. Comenius felt that to give words without things to the very young pupil was not only to retard his progress, but also to lay the foundation of vague and inaccurate conceptions. Hence his introduction of pictures for those beginning the study of Latin, connecting the word with the picture. An advance on this idea was made by Pestalozzi, who aimed at presenting to the eye the thing itself, whenever practicable. Hence, the modern object-lessons.

ORBIT, n. *ŏr'bĭt* [F. *orbite*—from L. *orbĭta*, a track, a path—from *orbis*, a circle: It. *orbita*]: the path or course described by a celestial body in the heavens (see below): the cavity in the skull containing the eyeball. **ORBITAL**, a. *ŏr'bĭt-ăl*, pertaining to the orbit of the eye.

OR'BIT, in Astronomy: path described in space by a heavenly body in its revolution round its primary.* The path so described is of elliptic form, and would be accurately an ellipse, were it not for the disturbing influence of the other heavenly bodies : see PERTURBATIONS. The complete determination of a planet's O. is of highest importance to astronomers, as it enables them to predict the planet's place in the heavens at any period, and thus determine the exact date of eclipses of the sun and moon, of transits and occultations of the planets, and of the appearances and disappearances of comets. For the determination of a planet's O., it is necessary to know three things: 1. The situation of the *plane* of the O. in space ; 2. The position of the O. in this plane; and 3. The situation at a given epoch, and rate of motion, of the planet in its O. Since the plane of the ecliptic is for convenience taken as the reference plane, the position of the plane of a planet's O. is known when its inclination to the plane of the ecliptic (1), and the line of intersection of the two planes (2), are known. Since the sun, which is the focus of the planetary orbits, lies in this line of intersection, the O. cannot lie wholly above or below the plane of the ecliptic, but must cut it in two points, called *Nodes* (q.v.), and the position of the line of intersection, or line of nodes, is generally given in terms of the longitude (or angular distance) of the ascending node, reckoning from the equinox. The situation of a planet's O. in its plane is determined when we know its form (3), size (4), and the position of its major axis or line of apsides (5). The size and form of the O. depend on the length of its major and minor axes, but astronomers prefer to employ the major axis and eccentricity (see ELLIPSE); and the position of the major axis is known by determining the heliocentric longitude of its *perihelion* (i.e., the extremity of it which is nearest the sun). To complete our knowledge of a planet's motion, all we now require are the epoch of its appearance at some determinate point of its O., say, at the perihelion (6), and the velocity of its motion in its O. (7), for when this last is known, the law of areas, as given in Kepler's second law, enables us to determine the position of the planet in its O. at any future period. These seven facts are called the seven 'elements of a planet's orbit.' The same principles apply to the orbits of the comets and satellites, though, in the case of the latter, the effect of disturbing forces is so great as to produce considerable change of the elements in one revolution.

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* The sun is the primary of the planets and comets, and each planet is the primary of its satellites (secondary planets).

ORBULINA, n. *ŏr'bū-lī'nă* [L. *orbis*, the world, a sphere]: foraminifera, in the form of perforated spheres.

ORC, n. *ŏrk* [L. *orca*, a whale]: a species of whale.

OR'CA: see GRAMPUS.

ORCADIAN, a. *ŏr-kā'dĭ-ăn* [L. *Orcădēs*, the Orkneys]: pertaining to the Orkney Islands: N. a native or inhabitant of the Orkneys.

ORCAGNA, *or-kân'yâ* [contraction of It. *Arcagnuolo*, archangel]; acquired name, ANDREA DI CIONE: famous Italian artist: 1316–76 approximately; b. Florence; son of a sculptor and goldsmith, his three brothers also becoming artists. During much of the 14th c., he stood pre-eminent—as a painter combining strong realistic qualities with spiritual, and as an architect and sculptor elaborating exquisite creations. Chief of the latter is the tabernacle of the Virgin, in the church of San Michele, Florence, said to have cost 96,000 florins; it is pure Gothic, richly inlaid, combining altar, shrine, reredos, pyramidal in general form, and of white marble; the spire upholds a figure of St. Michael; lower, on the roof, are the apostles, and the lateral panels have groups from the life of the Virgin; one of the figures represents the artist, with name and date 1359. The church itself was from his designs; and the beautiful Loggia di Lanzi, ascribed to him, may have been from his plans, but was erected after his death. He was, withal, a worker in mosaic, and a poet. His chief works as a painter are frescoes, notably those of the chh. of St. Maria Novella, and the Strozzi chapel, the latter having a *Last Judgment;* also the series in the Campo Santo at Pisa, the subjects including the *Triumph of Death*, the *Last Judgment* and *Hell.* To these Michael Angelo and Raphael are said to have been indebted. But the frescoes have been much injured by time, and have been more or less worked over in restorations. Still in good preservation are his admirable pictures in the altar-panels of the Strozzi chapel.

ORCEIN, n. *ŏr'sē-ĭn:* see under ORCIN.

ORCHARD.

ORCHARD, n. *ŏr'chĕrd* [Goth. *aurtigards;* Icel. *jurtagardr*, a garden: Dan. *urtgaard*, a herb-garden—from *urt*, a herb; *gaard*, a garden: AS. *ortgeard*, an inclosure for worts or vegetables—from *wort*, a herb; *geard*, a yard]: garden for fruit-trees; also the trees therein. **OR'CHARDIST**, n. *-ĭst*, one who owns or cultivates a fruit-garden. **ORCHARDING**, n. *ŏr'cherd-ĭng*, the cultivation of orchards.—An *Orchard* is a collection of trees cultivated for their fruit. The term is properly applied to trees producing larger fruits than those grown in the fruit-garden (q.v.) Apples, pears, peaches, plums, and cherries are the principal fruits grown in orchards in this country. A collection of orange trees is called a grove. As fruits are greatly modified by climate and soil the choice of varieties should be made with reference to the location in which they are to be grown. The land for an O. should be in a good state of fertility and should be enriched and given to the production of some cultivated crop the season previous to its being planted with trees. It should be well plowed and harrowed, and if wet should be thoroughly drained before the trees are put out. If too level for natural drainage, the ground should be plowed in ridges, upon which the trees should be set. Transplanting may be done either in the spring or after the leaves have fallen in autumn. Small trees will be more certain to grow and will come into bearing sooner than large ones. The rows should be perfectly straight. Holes should be made of sufficient size to allow the roots to be spread to their fullest extent and the tree should stand at about the same depth as it did in the nursery. Fine earth should be closely packed around the fibres and roots to keep the tree firmly in place and to exclude air from the roots. For several years after the trees are set the ground should be well cultivated. If properly manured, potatoes or root crops may be grown among the trees, but cultivation near the rows must be shallow. Grass should not be grown in the O. till the trees attain considerable size, and grain crops should never be allowed among the trees. A vigorous growth should be maintained by the application of fertilizers to the land late in the autumn. All kinds of farm stock must be kept from the young O. Protection from injury by mice may be secured by piling mounds of compost around the trunks in the autumn, and spreading the material over the ground in the spring. When the tree is set the top should be cut back to balance its loss of roots in removal. The form of the top should be regulated by careful pruning each season. When the trees become fruitful, overbearing should be prevented by a systematic thinning of the fruit. This will greatly improve the quality of the fruit, and prevent injury to the trees and exhaustion to the soil. The distance apart of trees in an O. is modified by the kind of fruit and to some extent by the variety—some sorts being much freer growers than others. The following are about the average distances: apples, free growing sorts, 40 ft., others 30 to 35 ft.; pears 20 to 25 ft.; peaches, 15 to 20 ft.; cherries, 20 ft., plums, 15 ft.; quince, 8 ft. The multiplication of varieties is effected by sowing the seeds of ripened fruit. The seeds should be taken from the finest specimens of fruit of the best varieties; and to gain advantage of natural cross fertilization, the selections should be from trees standing near each other. Propagation of varieties is effected usually by grafting the roots of small trees or the stocks or small branches of larger ones, or by budding.

Dwarfed Fruit Trees are planted where grounds are small, and it is desired to obtain fruit as quickly as possible. They are also grown for ornament. Trees may be dwarfed by planting in pots containing poor soil: the roots can extend but a little way, and the trees are practically starved. Another method of dwarfing is by inducing roots to form near the end of a branch, which is afterward removed and the roots confined where they will obtain but little food. But the course adopted by nurserymen is to graft or bud upon stocks which make only a slow and small growth. The fruit trees most frequently dwarfed are the pear, apple, and cherry. The pear is sometimes worked on the apple and the mountain ash, but usually and far more successfully on the quince. With some varieties the quality of the fruit is greatly improved by growing on the quince, and these sorts are seldom grown as standard trees. Other kinds do not grow readily on the quince, and in order to dwarf them the quince is first budded with a free-growing variety of the pear, and when the twig thus secured has reached a proper size, a bud of the desired kind is worked thereon. Only a few sorts require this double working. The majority of varieties do about as well on the quince as on their own roots, and dwarfs thrive in some soils in which the standards do not. Dwarf trees bear at a much earlier age, but they are shorter-lived and need more manure, pruning, and cultivation than standards. The apple is dwarfed by budding on the Paradise or the Doucin stock. The former is preferable where very small and early bearing trees are desired. These dwarfs reach a height of four ft., begin to bear in three or four years from the time of budding, and produce large and handsome specimens of fruit. Summer and autumn varieties are more often dwarfed than the winter sorts. The trees are beautiful and in small gardens are also useful. The cherry is sometimes dwarfed by working on the Mahaleb stock; and though in cold climates it has some advantages over the standard, it is also open to various objections, and the dwarfed trees have not a large sale. The distances apart for setting dwarfed trees are about as follows: pears, 10 ft.; apples, 8 ft.; cherries, 10 ft. Pears grown on quince stock and set in orchards where they receive less pruning than in the garden require 12 ft.; and apples on Doucin stocks 10 ft. space.

OR'CHARD GRASS: see **Cock's-foot Grass.**

ORCHARD-HOUSE: structure adapted to cultivation of fruits, of finer kinds than can be produced in the open air, or in greater perfection, without the aid of artificial heat. It is a glass-roofed shed, the front of which is lower than the back, so that the roof slopes toward the sun, and by due arrangement a limited space can be made to produce a prodigious quantity of fine fruit. The trees are planted in pots, are never allowed to attain a considerable size, and are so trained and pruned as to have the greatest possible amount of fruitful wood within the smallest possible compass. The pots have a large hole in the bottom, through which the roots may pass; and are placed upon a border carefully prepared for them, of loose and open materials, such as cinders, lime-rubbish, and broken bricks, enriched by manure. After the fruit is gathered, the roots are cut through at the bottom of the pot, and the trees are set aside to rest for the winter; and this treatment is repeated from year to year. The orchard-house is generally a very low structure, so that the foliage and fruit are very near the glass; its back being only 7 ft. high, and its front only 2½ ft., for a width of 12 ft. A path is excavated as a trench of 2 ft. deep, and 2½ ft. wide, through the middle of it. For details as to glazing, ventilation, and instructions as to treatment of trees, see *The Orchard-house* (pamphlet by the inventor Rivers, of London); also Chambers's *Information for the People*, I. 591–2 (new ed.).

ORCHESTRA, n. *ŏr′kĕs-tră* [Gr. *orchēstra*, the lowest part of a theatre, among the Greeks, where the chorus performed the dances—from *orche′ŏmai*, I dance: L. and It. *orchestra:* F. *orchestre*]: the part of a theatre or public place assigned to the musicians: body of musical performers; written also **ORCHESTRE**, *ŏr′kĕs-ter*. **ORCHESTRAL**, a. *ŏr-kĕs′trăl*, suitable to an orchestra, or performed in it.—*Orchestra* in the Greek theatres was the place allotted to the chorus of dancers; in modern theatres, to the instrumentalists; and in the modern concert-room, to the instrumental and vocal performers. The word denotes also the musicians collectively. A complete O. consists of stringed and wind instruments, and instruments of percussion. The employment of stringed and wind instruments together was long deemed a barbarism. Glück was among the first composers who showed that they could be effectively combined: his ideas were developed by succeeding composers. The perfecting of the old instruments, and the introduction of new ones formerly confined to military bands, have added immensely to the power and resources of the modern O., whose capacities, however, are sometimes misused. The proper strength of an O. depends on considerations connected with the locality. The stringed instruments should always greatly outnumber the wind instruments; and the wind instruments the instruments of percussion. The stringed instruments in general use are the violin, viola, violoncello, and double-bass, and their number often amounts to 50, while even in a large O there are seldom more than two each of flutes, hautboys, or bassoons. The horn, trumpet, and ophicleide or serpent—the other wind instruments admitted into the

O.—are admitted as sparingly; and of instruments of percussion, a pair of kettle drums is often considered sufficient, though cymbals and triangles are occasionally added. In a small orchestra, trumpets, trombones, the serpent, and the kettle-drum should be avoided as too noisy. By far the greatest part of the work falls to the share of the stringed instruments, the parts for which form a complete quartet for first violin, second violin, viola, and violoncello, which should be perfect within itself, independently of the parts for the wind instruments. The object of the double-bass is to enforce the violoncello part. This full quartet is occasionally interrupted by harmony in two or three parts, or passages in unisons or octaves. The success of the combination of wind and stringed instruments depends on the skill and judgment of the composer. The bassoon, horn, or flute may double any given part of the stringed instrument quartet, so as to produce an effect of reinforcement, or it may have its own distinctive melody. An occasional variety is produced by the entire cessation of stringed instruments for a short period, letting the wind instruments be heard alone. The O. of a concert-room should be so arranged that the front is about five ft. above the level of the floor, and it should rise gradually in steps toward the end wall, whose angles ought to be rounded off so as to reflect the whole body of sound. Reverberation is essential to the proper effect of music. From the exigencies of dramatic representation, a theatrical O. must necessarily be much inferior to a concert O.; the instrumentalists, brought together in the lowest part of a theatre on a horizontal plane between the spectators and the stage, are deprived of most of the advantages arising from a proper arrangement.

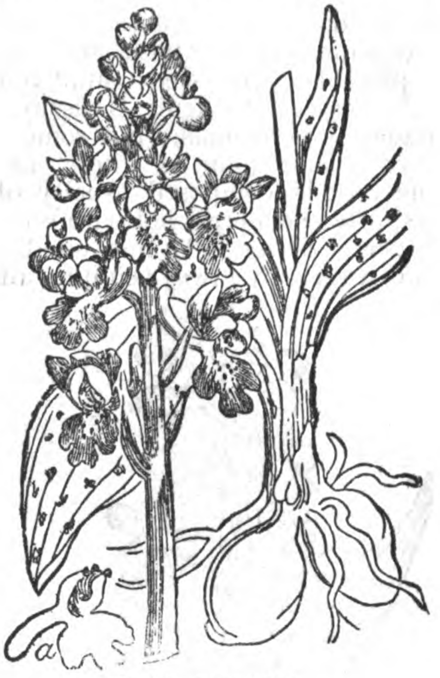
ORCHESTRION, *awr-kĕs'trĭ-on:* musical instrument, about 9 ft. in height, breadth, and depth, resembling a portable organ; with mechanism so constructed that all the sounds within its compass may be increased or diminished. It was invented about 1789 by the Abbé Vogler, but soon fell into disuse.

ORCHID, n. *awr'kĭd,* or ORCHIS, n. *awr'kĭs* [L. and Gr. *orchis,* a plant with roots in the form of testicles: It. *orchide:* F. *orchis*]: monocotyledonous plant having round fleshy tubers, whose flowers are generally singular in form—much esteemed by cultivators; plants of the ord. *Orchidācĕæ* (see ORCHIDACEÆ). ORCHIDACEOUS, a. *awr'kĭ-dā'shŭs,* or ORCHIDEOUS, a. *awr-kĭd'ĕ-ŭs,* pert. to plants of the orchis kind.

ORCHIDACEÆ, *awr-kĭ-dā'sē-ē,* or ORCHIDEÆ, *awr-kĭd'ē-ē;* popularly called ORCHIDS: natural order of endogenous plants, remarkable for the structure of their flowers, which are of great beauty and exquisite fragrance. The perianth sometimes exhibits much variety of forms, even in the same species; but is always irregular, its segments differing much from each other. There are usually six segments, arranged in two rows (*calyx* and *corolla*); though some of the most extraordinary forms of orchideous flowers are produced by the combination of certain segments into one piece. Spurs and other appendages of some of the segments are common. The inner segments are often beautifully colored. The inferior segment of the corolla is called the lip (*labellum*), and is often lobed, spurred, or furnished with curious appendages of different kinds. The stamens are united with the style into a single central column; the distinctive character of the Linnæan class *Gynandria*, of which the O. form the chief part. There is usually only one anther, with a tubercle on each side of it, the tubercles being abortive anthers; but sometimes the two lateral anthers are perfect, and the central one is abortive; and very rarely all three anthers are perfect. The anthers are usually two-celled; the grains of pollen cohering in two or more masses. The ovary is inferior, one-celled; the stigma usually a mere hollow in front of the column. The fruit is usually a capsule, opening with six valves, three of which have placentæ; the seeds numerous and very small. In a few cases, the fruit is fleshy. The O. are generally herbaceous perennials; but some in warm climates are shrubs, and some of these, as Vanilla, are climbers. The root is composed usually of simple, cylindrical fibres, often accompanied with one or two fleshy tubercles, a tubercle dying and a new one being produced annually. The leaves are always simple, alternate, often sheathing at the base, often leathery, sometimes arising, in tropical species, not directly from the stem, but from fleshy bulb-like excrescences of it.—The species of O. are very numerous, between 4,000 and 5,000, of which about 3,000 have been described. They are found in all parts of the world, except the coldest and the most arid regions; but are most numerous in the humid forests of the torrid zone,

Orchis morio.
a, parts of the flowers.

particularly in America. Many are epiphytes, adorning the boughs of trees with splendid flowers. This is chiefly the case with tropical species, those of colder climates mostly growing on the ground.—SALEP (q.v.), a nutritious article of food still used in the Levant, is obtained from root-tubercles of a number of species. The only other product of the order, which is of any commercial importance, is Vanilla (q.v.). The fragrant Faam (q.v.) leaves are the leaves of an orchid. Several species are known to possess tonic, stimulant, and antispasmodic properties, but none are of much importance in medicine.



Orchis mascula:
a, the lip of the perianth.

Orchids have of late been much cultivated for the peculiarity and beauty of their flowers, and many tropical species are among the most esteemed hothouse plants; houses being sometimes arranged specially for them. Many of the epiphytal kinds may be planted in pots filled with loose fibrous peat, the roots of others are placed in baskets, or are fastened to blocks of wood, with a little moss or some such thing around them, to keep them from becoming too dry, and are thus placed on the shelves, or suspended from the roof of the house. Careful attention to temperature is necessary, also to ventilation; and though much heat and moisture are requisite, the atmosphere must not be constantly very hot and humid, but seasons of rest must be given to the plants, which in their native climates have generally a wet and a dry season, the latter being to them in many respects what the winter is to plants of temperate regions. The orchids usually are propagated by division of the tubers. Even those that grow in the ground depend but little on the soil for nourishment, drawing their chief supply from the air. It is desirable to avoid for them a soil that holds moisture.—Lindley distinguished himself in the study of this important order.

OR'CHIL AND ORCHEL'LA WEED: see ARCHIL.

ORCHIS *awr'kĭs:* genus of *Orchidaceæ*, to which, as now restricted, 11 of the British species are referred. In a more general application it designates any member of the orchid group. The roots of some species of this genus yield salep. The *lip* of the flower in this genus has a spur. The flowers of the Early Purple O. (*O mascula*), one of the most common species, are sometimes fragrant; but those of the Lizard O. (*O hircina*) are remarkable for their disagreeable goat-like or lizard-like smell.

ORCHITIS, n. *ŏr-kī'tĭs* [Gr. *orchis*, a testicle]: inflammation of the testicle.

ORCHOMENOS, *awr-kŏm'ĕ-nos:* a famous and very ancient city of Bœotia, cap. of the anc. independent kingdom of the Minyæ, hence called Minyean O., to distinguish it from another O. in Arcadia. It was n. of Lake Copaïs, on the left bank of the Cephissus, and extended from the marshy edges of the lake up the face of a steep rocky hill, on which stood the Acropolis. In the earliest times, its dominions extended to the sea. Homer compares its treasures to those of Egyptian Thebes, and tells us that it sent 30 ships to the Trojan war. Some time after this event, it became a member of the Bœotian confederacy. During the Persian war, like the other towns of Bœotia, it abandoned the national cause. Its govt. was thoroughly aristocratic, and after the Peloponnesian war, when Thebes became a democracy, O. took part with Sparta, and shared in its first triumph over Thebes; but the victory of Epaminondas at Leuctra B.C. 371, placed O. at the mercy of the Thebans, who soon afterward destroyed it by fire, and sold its inhabitants as slaves. It was rebuilt during the Phocian war, but a second time destroyed in the reign of Philip of Macedon, who, however, once more rebuilt it; but it never again became prominent in history. O. was famous for its great musical festival in honor of the Graces, when poets and musicians assembled from all quarters to compete for prizes. The ruins of O. are still seen near the modern village of Skripú.—See K. O. Müller's *Orchomenos und die Minyer*, Leake's *Northern Greece*, and Mure's *Tour in Greece*.

ORCIN, n. *ŏr'sĭn* [F. *orcine*]: substance existing in the lichens from which archil and litmus are prepared. Orcin ($C_7H_8O_2$) may be obtained by boiling certain species of *Roccella* or *Lecanora* with lime for some hours, removing the lime by a current of carbonic acid, evaporating and extracting with boiling alcohol, from which the O. separates in red crystals. With chloride of lime, it gives a purple red color, which quickly changes to a deep yellow. O. is the true color-producing substance or chromogen of these lichens. **ORCEIN**, n. *ŏr'sĕ-ĭn* ($C_7H_7NO_3$), dark-red pigment obtained by the action of ammonia and oxygen on orcin. It is a nitrogenous compound of strong tinctorial power. When isolated, orcein forms a red flocculent powder, freely soluble in alcohol, forming a scarlet fluid. Potash and ammonia dissolve it readily, forming a splendid purple, the basis of the ordinary archil of commerce. With metallic salts, its alkaline solutions yield beautiful purple lakes.

ORCUS, n. *ŏr'kŭs* [L.]: in *Rom. myth.*, the lower regions; the abode of the dead.

ORD, *awrd*, **EDWARD OTHO CRESAP**: 1818, Oct. 18—1883, July 22; b. Cumberland, Md. He graduated from West Point 1839, served in Fla. in the Seminole war about three years as 2nd lieut. of artillery, and was promoted 1st. lieut. 1841. He was transferred to the Pacific coast 1847 and prevented threatened outbreaks in that region during part of the Mexican war. He reached the rank of capt. 1851, served in Mass. two years; then returned to the west, and was engaged in making a coast survey, and later in keeping the restless Indian tribes of the region under control. Soon after the opening of the civil war he was called to the east, appointed brig.gen. vols., and placed in command of a brigade of Penn. troops. At the battle of Dranesville, Va., he defeated the Confederate force under Gen. Stuart. He was promoted maj.gen. vols. 1862, May, and the following month was transferred to the valley of the Miss. under Gen. Halleck, and afterward under Gen. Grant. He received honorable mention for brilliant service in the battles near Corinth, and in one of these engagements was seriously wounded. At the siege of Vicksburg and in the taking of Jackson, Miss., he rendered efficient service. Failing health compelled his retirement for several months; but 1864 he was called to quell disturbances around Baltimore, and later in that year commanded a force at Petersburg, where he was severely wounded. Illness again caused his temporary retirement; but 1865 he succeeded to the command of the dept. of Va. and the Army of the James, and showed great skill and bravery in the attack on Richmond, and in the closing operations of the war. His connection with the volunteer service closed 1866, Sep. After serving on the Pacific coast and in the southwest, he was retired 1880, Dec. 6. By various promotions he had reached the ranks of lieut.-col. of artillery, maj.gen. vols., and brig.gen U. S. A. After leaving the army he was civil engineer of a railroad in Mexico. He died at Havana, of yellow fever, while on a journey to New York.

ORDAIN, v. *ŏr-dān'* [L. *ordinārĕ*, to arrange or set in order—from *ordo*, order, arrangement: OF. *ordener*, F. *ordonner*, to ordain: It. *ordinare*]: to appoint; to decree; to establish; to institute; to invest with ministerial or sacerdotal functions. **ORDAIN'ING**, imp.: ADJ. investing with sacerdotal or ministerial functions by certain ceremonies, as the laying on of hands. **ORDAINED**, pp. *ŏr-dānd'*. **OR'DINA'TION**, which see. **ORDAIN'ER**, n. *-ėr*, one who ordains or appoints.—SYN. of 'ordain': to arrange, regulate; set; prescribe; enact; constitute; invest.

ORDEAL, n. *ŏr'dĕ-ăl* [AS. *ordæl;* Dut. *oordeel*, a mode of judgment by fire or water, by wager of battle, and the issue was supposed to be determined by the hand of God: Ger. *urtheil*, judgment: mid. L. *ordalium*]: ancient form of trial to determine guilt or innocence by causing the accused to pass through fire or water, or by the wager of battle; any severe test of patience, courage, skill, and the like; a severe trial or scrutiny. *Note.*—The latter part of the word is the same as *deal* 1 or *dole*, as seen by Dut. *deel*, Ger. *theil;* the first part is Dut. *oor-*, Ger. *ur-*, Goth. *us*, out, out of—see Skeat.—The practice has prevailed largely among widely-separated nations, of referring disputed questions, particularly such as relate to the guilt or innocence of an individual, to the judgment of God, determined either by lot, or by the success of certain experiments. Of its existence among the ancient Jews, we have an instance in Numbers v., where a Hebrew woman, accused of adultery, is required to drink the waters of jealousy as a test of innocence: a similar ordeal for incontinence is in use among the natives of the Gold Coast of Africa. Compurgation of accused persons by fire, as existing among the Greeks, is referred to in Sophocles's *Antigone.* Among the Hindus, the O. has been practiced in nine different ways—by the *balance*, by *fire*, by *water*, by *poison*, by the *cosha* or drinking water, in which images of the sun and other deities had been washed, by *chewing-rice*, by *hot oil*, by *red-hot iron*, and by drawing two images out of a jar into which they have been thrown. (*Asiatic Researches*, I. 389.)

The O. seems prevalent throughout Africa. 'When a man,' says Dr. Livingstone, 'suspects that any of his wives have bewitched him, he sends for the witch-doctor, and all the wives go forth into the field, and remain fasting till that person has made an infusion of the plant (called "goho"). They all drink it, each one holding up her hand to heaven in attestation of innocency. Those who vomit it are considered innocent, while those whom it purges are pronounced guilty, and put to death by burning. The innocent return to their homes, and slaughter a cock as a thank-offering to their guardian spirits. The practice of O. is common among all the negro nations north of the Zambesi.' The women themselves eagerly desire the test on the slightest provocation; each is conscious of her own innocence, and has the fullest faith in the *muavi* (the O.) clearing all but the guilty. There are varieties of procedure among the different tribes. The Barotse pour the medicine down the throat of a cock or dog, and judge of the innocence or guilt of the person accused by the vomiting or purging of the animal.

Throughout Europe in the dark ages the O. existed under the sanction of law and of the clergy. The most prevalent kinds were those of *fire*, *water*, and the *wager of battle. Fire ordeal* was allowed only to persons of high rank. The accused had to carry a piece of red-hot iron some distance in his hand, or to walk nine ft. barefoot and blindfolded over red-hot plowshares. The hand or foot was bound up and inspected three days afterward: if the accused had escaped unhurt, he was pronounced innocent; if otherwise, guilty. Under such a judicial system, there were probably few acquittals; but it is believed that in the severer kinds of O., precautions were sometimes taken by the clergy to protect those whom they wished to clear from suspicion. Queen Emma, mother of Edward the Confessor, when suspected of a criminal intrigue with Alwyn, Bp. of Winchester, is said to have triumphantly vindicated her character by walking unhurt over red-hot plowshares. *Water ordeal* was the usual mode of trial allowed to bondsmen and rustics, and was of two kinds—the O. of *boiling water*, and of *cold water*. The O. of *boiling water*, according to the laws of Athelstane, consisted in taking a stone out of boiling water, where the hand had to be inserted as deep as the wrist; what was called the triple O. deepened the water to the elbow. The person allowed the O. of *cold water* (usual mode of trial for witchcraft), was flung into a river or pond; if he floated without any appearance of swimming, he was judged guilty—while if he sank, he was acquitted.

The *wager of battle* was a natural accompaniment of a state of society which allowed men to take the law into their own hands. The challenger faced the west, the challenged person the east; the defeated party, if he craved his life, was allowed to live as a 'recreant;' that is, on retracting the perjury which he had sworn to. See BATTEL, TRIAL BY.

Other kinds of O. were practiced in particular circumstances in different parts of Europe. In the O. of the *bier*, a supposed murderer was required to touch the body of the murdered person, and pronounced guilty if the blood flowed from his wounds. The O. of the *Eucharist* was in use among the clergy: the accused party took the sacrament in attestation of innocence, it being believed that, if guilty, he would be immediately visited with divine punishment for the sacrilege. A somewhat similar O. was that of the *corsned*, or consecrated bread and cheese: if the accused swallowed it freely, he was pronounced innocent; if it stuck in his throat, he was presumed to be guilty. Godwin, Earl of Kent, in the reign of Edward the Confessor, when accused of the murder of the king's brother, is said to have appealed to the O. of the corsned, and been choked by it. An early form of O., abolished by Louis le Debonnaire 816, was that of the *cross:* the accuser and accused stood upright before a cross, and he who first fell, or shifted his position, was pronounced guilty. It was abolished, as being irreverent toward the mystery of the cross. Besides these, there was the O. by *lot*, dependent on the throw of a pair of dice, one marked with a cross, the other plain.

Trial by O. at first carried with it the sanction of the priests, as well as of the civil power, though the clergy in the course of time came to discountenance it. In England it seems to have been continued till the middle of the 13th c. On the continent generally it was abolished rather earlier, though as late as 1498 we find the truth of Savonarola's doctrine put to the test, by a challenge between one of his disciples and a Franciscan friar, to walk through a burning pile. In Scotland, 1180, we find David I. enacting, in one of the assemblies of the frank tenantry of the kingdom, which were the germ of parliaments, that no one was to hold an ordinary court of justice, or a court of O., whether of battle, iron, or water, except in presence of the sheriff or one of his sergeants; though if that official failed to attend after being duly summoned, the court might be held in his absence. The first step toward abolition of this form of trial in Saxon and Celtic countries, seems to have been the substitution of compurgation by witnesses for compurgation by ordeal. The near relatives of an accused party were expected to come forward to swear to his innocence. The number of compurgators varied, according to the importance of the case; and judgment went against the party whose kin refused to come forward, or who failed to obtain the necessary number of compurgators. To repel an accusation, it was often held necessary to have double the number of compurgators who supported it, till at length the most numerous body of compurgators carried the day.

ORDER, n. *ŏr'dėr* [F. *ordre*—from L. *ordĭnem*, an arranging, order: It. *ordine*]: methodical arrangement; regularity; established method or process; proper state; regular government; a law; a command; rank or class; a society or fraternity (see ORDER, RELIGIOUS). In *nat. hist.*, group of animals or plants constituted for the purpose of classification, inferior to *class* and *sub-class*, but superior to *family*, *tribe*, *genus*, etc. The use of the term, however, is not precisely the same in botany and in zoölogy, by reason of the greater range of zoölogy. A botanical order is often called a *family*, while the division corresponding to *family* in zoölogy is often termed in botany a *tribe*. The term NATURAL ORDER is used in botany to designate an order belonging to the natural system of classification, in distinction from one of an artificial system devised for mere convenience of the student; and it signifies that the limits of the order agree with the truth of nature, and that it thus exhibits affinities really existing. In all branches of nat. history, classification now proceeds on this principle. In *classic arch.*, one of the five principal methods employed by the ancients in constructing and ornamenting the columns of an edifice—these were (1) Tuscan, (2) Doric, (3) Ionic, (4) Corinthian, (5) Composite; the first and fifth were Roman orders, and mere modifications of the others; the remaining three were Greek: technically the Order or Ordonnance comprises the column with its base and capital and the entablature (see COLUMN: GRECIAN ARCHITECTURE: ROMAN ARCHITECTURE). In *OE.*, measures; care. INT. a call to a speaker by one or more of an audience to attend to the rules of the house or assembly: V. to regulate; to direct or command; to lead; to manage; to give directions to. OR'DERING, imp.: N. disposition; management. OR'DERED, pp. *-dėrd.* OR'DERER, n. *-ėr*, one who orders.

Or'derless, a. *-lĕs*, disorderly. **Or'derly, a.** *-lĭ*, regular; systematic; performed in good order; peaceable; being on duty, as an officer: N. a soldier who attends on a superior officer to carry orders (see below): Ad. methodically. **Or'derliness**, n. *-nĕs*, the state of being orderly or methodical. **In order**, according to established rule. **In order to**, for the purpose of; as means to an end. **Order-book**, a shop-book for entering the orders of customers, or directions for purchasers. **Order of the day**, a phrase used in legislative and deliberative assemblies, denoting the business regularly set down for consideration on the minutes or votes; in *mil.*, specific directions or information issued by a superior officer to the troops under his command. **Out of order**, transgressing the ordinary rules or laws of the society or meeting. **Orders**, or **Holy orders**, in the *Episcopal Chh.*, the three orders of the Christian ministry, but usually understood as applying to deacons and priests (see Holy Orders, below; also Ordination). **To take orders**, to enter the ministry of the church by being ordained—used in reference to the two *orders*, deacons and priests; to take commissions to supply goods. **Army orders**, general, divisional, brigade, or regimental. General orders are issued by the commander-in-chief of an army, and affect the whole of his force. The others emanate from generals of division or brigade, or from officers commanding regiments, and severally affect their respective commands. **Letters of orders**, the certificates given by the bishop to the person he has ordained, that the latter has been duly admitted to the order of deacons or priests. **General orders**, the orders which a commander-in-chief issues to his troops. **Religious orders**, in the *R. Cath. Chh.*, societies established for religious purposes, such as the monastic orders of the Benedictines, the Franciscans, etc., and the order of the Jesuits (see Order, Religious). **Orders in council**, temporary rules or laws issued by the sovereign, by and with the advice of the *Privy Council*, to meet particular emergencies (see below). **Order of battle**, the different arrangements made by an army either to attack or receive an enemy. **Orders of knighthood**, see Knighthood. **Post-office order**, see Money Order, under Money. **Standing orders**, in *parliament*, certain rules and regulations laid down for their own guidance, which must be invariably followed, unless suspended by a formal vote to meet some urgent case. **Sailing orders**, the particular and final instructions given to ships of war.—Syn. of 'order, n.': method; mode; mandate; injunction; direction; precept; rule; regulation; row; grade; group; collection; family; tribe; fraternity; usage; fashion; custom;—of 'order, v.': to adjust; conduct; procure; methodize; dispose; arrange; systematize.

OR'DER, Religious: aggregate of communities usually conventual, comprehended under one rule. There were also the societies, half religious, half military, out of which the institution of knighthood sprang; which arose from the necessity under which the monks lay of defending the possessions which they had accumulated, and the supposed duty of recovering Palestine from the Saracens, and retaining possession of it. The most famous among many orders of this kind were the Hospitallers or Knights of St. John of Jerusalem, the Knights Templars, and the Teutonic order: see KNIGHTHOOD. Religious orders, beside these military orders included the monastic and the mendicant.

The earliest comprehension of monastic societies under one rule was effected by St. Basil (q.v.). Abp. of Cæsarea (329–379), who united the hermits and cœnobites in his diocese, and prescribed for them a uniform constitution, recommending at the same time a vow of celibacy. The Basilian rule subsists to the present day in the Eastern Church. Next in time was the Benedictine order, founded by St. Benedict (q.v.) of Nursia (480–543), who considered a mild discipline preferable to excessive austerity. The offshoots from the Benedictine order include some of the most important orders in ecclesiastical history, among others the Carthusians, Cistercians, and Præmonstrants. The order of Augustinians professed to draw their rule from the writings of St. Augustine (q.v.); they were the first order not entirely composed of laymen, but of ordained priests, or persons destined to the clerical profession.

The three mendicant orders of Franciscans, Dominicans, and Carmelites were instituted in the 13th c. Their principal purpose was to put down the opposition to the church, which had begun to show itself, and to reform the church by example and precept. At a later period the order of the Jesuits was founded, with the object of increasing the power of the hierarchy and putting down heresy.—For notices of the more important orders, monastic, military, and mendicant, see the separate titles: also MONACHISM: KNIGHTS.

ORDERICUS, *awr-dĕ-rī'kŭs*, **Vitalis**: mediæval historian: 1075—about 1143; b. Atcham, near Shrewsbury, England. He was taken to France at the age of five, was educated for monastic life in the abbey of Ouche, at Lisieux, and became a priest 1107. O. was author of a so-called Church History (*Historiæ Ecclesiasticæ*), 13 vols., a chronicle of events from the birth of Christ to his own time. Books 3–6 give an account of the Norman wars in England, France, and Apulia till the death of William the Conqueror. The last half of the book is the most valuable, being a record of the history of the author's own times. The first ed. of *Historiæ Ecclesiasticæ* was published by Duchesne, in *Hist. Norm. Scrip.* (1619). It has been printed also by the French Hist. Soc. (1840), and was translated into English by Forester (4 vols.—Bohn's *Antiquarian Library*).

OR'DERLY: soldier or sergeant appointed to wait on general and other commanding officers, to communicate their orders, and to carry messages. The *Orderly Officer*, or officer of the day, is the officer of a corps or regt., whose turn it is to superintend its interior economy, as cleanliness, the goodness of the food, etc. *Orderly Non-commissioned Officers* are the sergeants in each company who are 'orderly,' or on duty for the week. On the drum beating for orders, they proceed to the Orderly Room, take down the general or regimental orders affecting their respective companies, show them to the company officers, and warn the necessary men for any duties specified in those orders. An *Orderly Book* is provided by the captain of each troop or company in a regt. for the insertion of general or regimental orders from time to time issued.

OR'DERS, HOLY: institution regarded in the Greek and Roman churches as a sacrament, by which ministers are especially set apart for the service of religion, and are regarded as receiving a certain religious consecration, or, at least, designation for their office (see ORDINAL: ORDINATION). While some of the reformed churches altogether deny a distinction of ranks in the ministry, none of them admits more than three ranks, bishop, priest, and deacon. But in the Roman and Greek churches, a further classification exists. In the Roman Church, a distinction is made between the major (or holy) orders and the minor orders. For general description of three of the major orders, viz., the three classes bishops, priests, and deacons, see HIERARCHY. A fourth rank of sub-deacons is generally regarded as one of the major orders, but its functions closely resemble in their nature and their degree those of the deacon. The minor orders in the Roman Church are four in number—door-keeper, reader, exorcist, and acolyte. To none of these orders is any vow of celibacy annexed. Some of their functions had their origin in the peculiar religious condition of the early church. The duties of door-keeper arose chiefly out of the discipline in regard to the penitents and catechumens; but though these functions find no room in the modern discipline of the Roman Church, the door-keeper of the modern church is held to succeed to other functions of his ancient prototype in relation to the catechetical instruction of children and of the poor and ignorant. Preparatory to the receiving of these orders, candidates are initiated in what is called the *Tonsure*, which consists in the cutting off of the hair, as a symbol of separation from the world and its vanities—a rite which appears also as one of the ceremonies of the religious profession. Tonsure, however, is not reckoned as an order; it is but a distinguishing characteristic of a class. In the Roman Church, the sacrament of orders is held to produce an indelible character, and therefore to be incapable of being forfeited or of being validly repeated. This, however, applies only to the holy orders. The Greek Church has the distinction of major and minor orders, in common with the Roman. But the Greeks commonly exclude sub-deaconship from the major orders, and all the functions of the four minor orders of the Roman Church are united by the Greeks in a single order, that of reader (*anagnōstes*).

In the Anglican and other Reformed Episc. churches, only the three higher orders, bishop, priest, and deacon are retained. An Anglican clergyman may be deprived of his benefice, or suspended by his bishop for various ecclesiastical offenses; and the right of the court of arches also to pronounce sentence of deprivation has been recognized. But in the usual case of deprivation, the clergyman does not forfeit his status of priest or deacon, which can be lost only by deposition or *degradation*. The ordinary has the power of degrading clerks convicted of treason, petit treason, murder, and certain other felonies, before judgment. A bp. may be deprived of his see by his metropolitan, with or without the co-operation of a synod of the bishops of the province; but it has been questioned whether he can be lawfully deprived of his orders as bishop. A clergyman of the Church of England cannot become a member of the house of commons; but there is nothing to prevent a minister of the Church of Scotland, or of any Presb. or Congl. church, from membership in the house of commons.

In Congl., Presb., and other non-episcopal churches, the ceremony of ordination is not held to impart any indelible character. A minister found guilty of heresy or immorality, is deprived of his office by *deposition*, by which his clerical status is forfeited. His removal from his charge, however, in any other way, does not affect his office as a minister; and a minister removed from one charge to another, or, after a time, inducted into a new charge, is not re-ordained. A minister having no charge or flock, may yet dispense the sacraments, if duly called upon. A minister deposed ceases altogether to be a minister, and is no more capable of any of the functions of the office, than if he had never been ordained.

The ceremony of *imposition of hands* is used in almost all Prot. churches in ordination of ministers, the ordaining bishop or presbyters placing the right hand on the head of the person ordained; and this act is always accompanied with prayer. In some denominations the act is deemed a proper and Scriptural form (I Tim. iv. 14), but not essential. In the Church of Scotland and other Presb. churches, when an already ordained minister is inducted into a new charge, no imposition of hands takes place. In the Scottish and American Presb. churches, candidates for the ministry are *licensed to preach the gospel* before being *called* to any particular charge, and are then styled *licentiates* or *probationers*. They are licensed, according to an old phrase, 'for trial of their gifts,' but are not entitled to dispense the sacraments; but this rule is not usually held with strictness in all Congl. churches, in which churches, indeed, though 'licensure' is regarded as *regularly* precedent to preaching, it is not considered indispensably so.

ORDERS IN COUNCIL: in Great Britain, orders by the sovereign with advice of the privy council. The privy council has no power to legislate, except so far as authorized to do so by parliament; nevertheless in emergency, it has occasionally issued and enforced orders of a legislative kind; those who were concerned in passing, promulgating, or enforcing the orders, trusting to subsequent parliamentary protection, and taking on themselves the personal responsibility of the proceeding. In such cases, an act of indemnity afterward passed has relieved from liability those who advised the order or acted under it, and given compensation to all who suffered by its enforcement. This course was adopted 1766 with regard to an embargo on the exportation of corn, issued in consequence of a deficient harvest and prospect of famine. An important constitutional question was raised by the famous Orders in Council issued by Great Britain 1807 and 9, in reprisal for Napoleon's Berlin and Milan decrees: see Continental System. The Berlin decree, 1806, Nov. 21, declared the whole of the British islands in a state of blockade, and all vessels trading to them to be liable to capture by French ships. It also shut out all British vessels and produce from France and from all countries which gave obedience to the French. A decree soon afterward obliged all neutral vessels to carry letters or certificates of origin—that is, attestations by the French consuls of the ports whence they had sailed, that no part of the cargo was British. In retaliation for the Berlin decree, the British govt. issued, 1807, Jan. 7, an Order in Council, subjecting to seizure all neutral vessels trading from one hostile port in Europe to another with property belonging to an enemy. This order was at first extensively evaded, while the French made vigorous efforts to enforce the Berlin decree; the result was, that new Orders were issued by the British govt., 1807, Nov. 11, 21, declaring France and all states subject to the French to be in a state of blockade, and all vessels liable to seizure which were found to have certificates of origin on board, or which should attempt to trade with any of the ports of the world thus blockaded. Neutral vessels intended for France, or any other hostile country, were ordered, in all cases, to touch first at some British port, and to pay custom-house dues there, after which they were in certain cases to be allowed to depart for their destination; and vessels clearing from a hostile country were similarly to touch at a British port before proceeding on their voyage. 1807, Dec. 27, Napoleon's Milan decree was issued, which declared the whole British dominions in a state of blockade, and all countries were prohibited from trading with each other in any articles of British produce or manufacture. The Americans, and those of the public of Great Britain who were interested in the export trade, exclaimed loudly against the edicts of both powers, and the legality as well as the expediency of the Orders in Council were called in question in parliament. The result was, that an inquiry was instituted into the effect of the orders, from which no direct result followed. But, in the mean time, 1808, Apr. 26, a new Order in Council was issued, limiting the blockade to France, Holland, a part of Germany, and n. Italy; and the order condemning vessels which had certificates of origin on board was rescinded. Subsequent orders introduced a system of furnishing licenses to vessels to proceed to hostile ports after having first touched and paid custom-house dues at a British port; no fewer than 16,000 of these licenses are said to have been granted. The legality of these Orders has been called in question, on the ground that they were more legislative than executive, so far as a fictitious blockade, where there is no actual blockading force present, is contrary to the law of nations; but the legality has been defended on the ground that they were issued in execution of the royal prerogative of declaring and conducting war. They are commonly believed to have added to the general distress, and to the check on manufactures produced by Napoleon's decrees; though, on the other hand, it has been maintained that they were essential to the effective prosecution of the war.

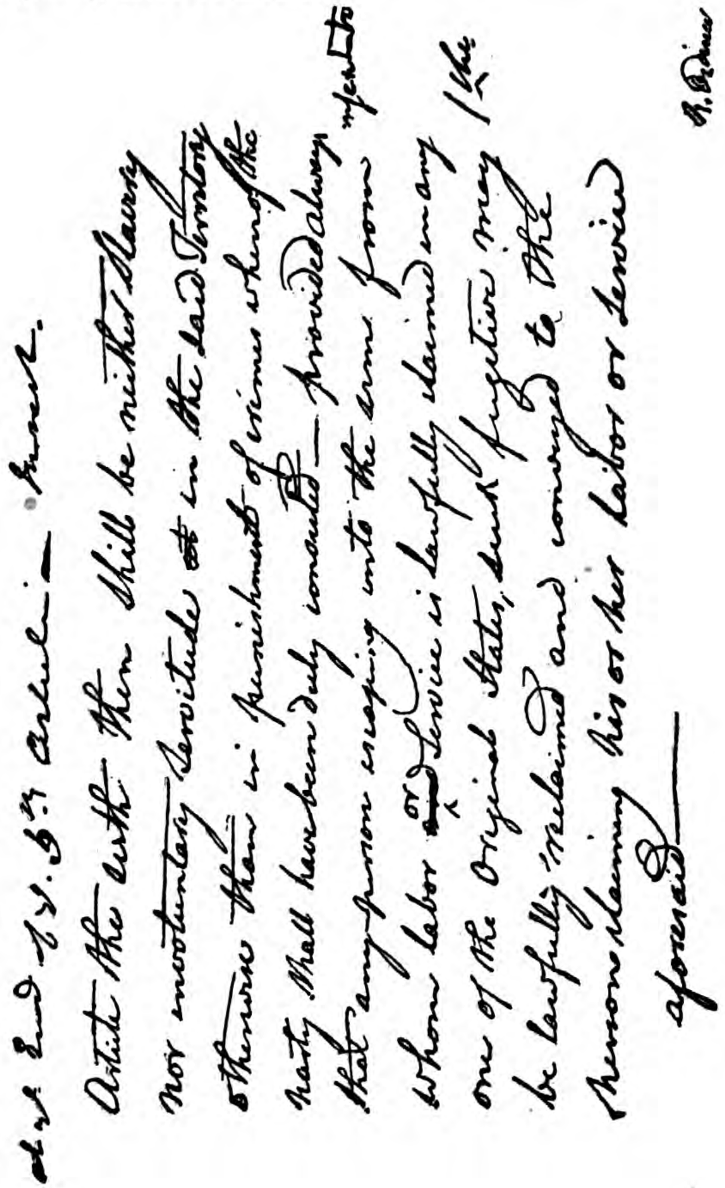
There are various matters connected with trade and the revenue as to which Orders in Council have been authorized by statute; parliament, in fact, delegating its legislative authority to the sovereign in council.

ORDINAL, a. *ŏr'dĭ-năl* [F. *ordinal*, ordinal—from L. *ordinālis*—from *ordo* or *ordĭnem*, order]: denoting order: N. in the *Eng. Chh.*, the service of ordination (see below). **Ordinal numbers**, numbers in succession, as first, second, third, etc.

OR'DINAL: service in Episc. churches for ordination of ministers (see ORDERS, HOLY: ORDINATION.) The English O. was drawn up by a commission appointed in the third year of Edward VI. (1550); and it was added to the *Book of Common Prayer*. It was slightly modified in the reign of Elizabeth, and was again revised by the convocation of 1661. The English O., in its general structure, resembles the ancient services used for that purpose, but is much more simple, and has some features—e.g., the numerous questions addressed to the candidates—peculiar to itself. There are separate services for the 'making of deacons' and the 'ordering of priests,' but these are practically joined in one, and used on the same day. The service for the consecration of bishops is altogether distinct. The ordination takes place at one of the Ember seasons, and during the public service, after morning prayer and a sermon on the subject. It begins with presentation of the candidates by the archdeacon. The bishop inquires as to their fitness, and commends them to the prayers of the congregation. The litany is then said with special petitions for the candidates for each order; and the communion service commences with a special collect, epistle, and gospel. Between the epistle and gospel, the oath of supremacy is administered, and the candidates for deacon's orders are questioned by the bishop, and ordained. The gospel is read by one of the newly-ordained deacons. The candidates for priests' orders are then solemnly exhorted and interrogated, and the prayers of all present are asked for the divine blessing upon them. For this purpose a pause is made in the service for silent prayer. After this the hymn, *Veni Creator Spiritus* (Come, Holy Ghost, our Souls Inspire)—a composition of great antiquity, supposed by some writers to be as old as the 4th c.—is sung, and the candidates kneeling before the bishop, he and the assistant presbyters lay their hands upon the head of each, with the words, 'Receive the Holy Ghost for the office and work of a priest in the Church of God,' etc. The only other ceremony is the presentation of each candidate with the Bible in token of authority to preach; as the deacons had been before presented with the New Testament with authority to read the gospel. The service concludes with the administration of the sacrament of the Lord's Supper.—The ordination service in the Prot. Episc. Chh. in the U. S., differs only in minor details from that in the English Church. The consecration of bishops in the Chh. of England is performed by an abp., or some bp. appointed in his place, and two or more of his suffragans, and may take place on any Sunday or holy day. The service is very similar to that for the ordination of priests.

ORDINANCE, n. *ŏr'dĭ-năns* [OF. *ordenance;* F. *ordonnance*, an ordinance or rule—from L. *ordĭnans*, arranging, regulating—from *ordo*, order]: permanent rule of action; observance commanded; a law; a regulation; canon; religious rite or ceremony. **OR'DINANT, a.** *-dĭ-nănt*, **in** ***OE.***, **ordaining; decreeing.**

OR'DINANCE OF 1787: act passed by the 7th continental congress, 1787, July 13th, for the govt. of the terr. of the U. S. n.w. of the Ohio, and prescribing conditions under which states should be formed from it, the chief one being the total exclusion of slavery. In 1780, Oct., congress first provided for forming new states out of the N.W. Terr. In 1781, Jan. 2, Va. ceded to the United States all its terr. n.w. of the Ohio, but with a condition which made it of no effect. In Nov. an elaborate report to congress presented a plan for laying out the terr. for settlement. Early in 1783 Rufus Putnam and others formed a plan for a state w. of the Ohio, and Timothy Pickering of Mass. proposed that it adopt 'the total exclusion of slavery.' A 'pioneer ordinance' for colonizing the N. W. Terr. was brought forward 1783, June 5, by Theodorick Bland of Va., and seconded by Hamilton of N. Y. It was referred to a grand committee which had been named May 30. In Oct. congress resolved on a committee to report a plan of govt. for the terr. toward which many officers and soldiers were already looking for their future homes. as Washington advised in a farewell address, Nov. 2. 1784, Mar. 1, Jefferson, Monroe, and others of Va., gave a deed of cession of the rights of Va. within the terr.; and the same day Jefferson presented to congress a plan for the govt. of the terr. and its division into ten states, with a proviso that after 1800 neither slavery nor involuntary servitude should exist in any of them. Apr. 19 this proviso was stricken out, and Apr. 23 the ordinance (of 1784) was adopted, and remained in force three years. In 1786, Apr. probably, a new committee was raised for reporting on a govt. for the N. W. Terr., and Monroe, chairman, presented its report May 10; but no further action was had. Sep. 19 a new report was made, but not acted on before the 6th congress expired, Sep. 30. A new congress, 1787, Feb., included Madison, Richard H. Lee, Grayson, and Ed. Carrington, from Va. The project of 1786, Sep., was revived, 1787, Apr., and read a second time May 9, but there suspended, on a memorial presented by S. H. Parsons, agent of the Ohio Co., asking congress to promote the settlement of a state beyond the Ohio. May 11—July 4 lack of a quorum prevented action of congress, and July 5, Dr. Manasseh Cutler, another representative of the Ohio Co., arrived, and from July 6 took a leading part in securing the consent of southern members to favorable action. A new committee was named July 9, and reported an ordinance July 11, broadly providing for govt., colonization, etc., and for freedom of religion, security of contracts, public education, etc., but with no mention of slavery. July 13, at the second reading, a sixth special article was added to the ordinance, on motion of the scribe of the committee, Nathan Dane of Mass., but representing the views to which Grayson, Richard H. Lee, and Carrington, of Va., had assented, and which Dr. Cutler had especially urged on behalf of the Ohio Co.'s proposed plan for settling a state. The new article irrevocably excluded slavery, but authorized the recovery of fugitive persons owing labor or service. The ordinance thus finally shaped was passed by the votes of Ga., S. Car., N. Car., Va., Del., N. J., N. Y., and Mass.; the states of Penn., Conn., R. I., and N. H. not taking part because they had no members present. The sixth article had the effect to prevent the extension of slavery into Ind. and Ill., where otherwise it would have gone, and thereby gave to free soil a preponderance decisive of the conflict of north and south two generations later. It may perhaps be said that no piece of writing still in existence ever wrought so great results as this fragment pasted on the bottom of the second page of the original printed ordinance:



Art. 2nd 14. 5th Article — Insert.

Article the sixth There shall be neither Slavery
nor involuntary Servitude ~~ot~~ in the said Territory
otherwise than in punishment of crimes whereof the
party shall have been duly convicted — provided always
that any person escaping into the same from [illegible] to
whom labor ~~and~~ or Service is lawfully claimed in any
one of the Original States, such fugitive may / the
be lawfully reclaimed and conveyed to the
person claiming his or her labor or Service
aforesaid —

R. Ordinance

OR'DINARIES, or Honorable Ordinaries, in Heraldry: certain charges composed of straight lines, and in very common use, to which writers on heraldry had assigned abstruse symbolical meanings, but whose chief peculiarity seems really to be that they originally represented the wooden or metal fastenings of the shields in actual warfare. The O. are usually accounted nine—the Chief, Pale, Fess, Bar (or Pile), Bend, Bend Sinister, Chevron, Saltire, and Cross (see these titles).

ORDINARY, a. *ŏr'dĭ-nă-rĭ* [F. *ordinaire*, ordinary—from L. *ordinārius*, of or belonging to arrangement or order—from *ordo*, order: It. *ordinario*]: according to established order; customary; usual; of common rank or quality; plain; not handsome; common; of little merit: N. an ecclesiastical judge, usually the bishop (see Ordinary, below): in *Scot.*, a single judge; having power to decide cases either with or without a jury; settled establishment; certain charge found on a heraldic shield (see Ordinaries): a dining-place where the prices are fixed; the meal furnished; name applied to the chaplain of Newgate. Or'dinarily, ad. *-nă-rĭ-lĭ*, according to established rules or settled method. Ordinary seaman, one capable of the lower duties, but not expert or fully skilled; an inferior seaman. In ordinary, in constant service; statedly attending and serving; as applied to a ship of war, one laid up in harbor out of actual use, sometimes dismasted, and sometimes roofed over for protection from weather, while in dockyards near by their masts and gear lie ready for their immediate fitting for sea when required. Ordinary of arms, in *heraldry*, index of armorial coats, arranged, according to the leading charges in the respective shields, so as to enable any one conversant with heraldic language, on seeing a shield of arms, to tell to whom it belonged. A very imperfect ordinary for England is appended to Edmonson's *Heraldry:* one far more complete, Papworth's *Ordinary of British Armorials*, was pub. 1874.—Syn. of 'ordinary, a.': established; methodical; regular; mean; normal; inferior.

OR'DINARY: person, who, in virtue of his office, and in his own consequent right, is competent to do certain acts or to decide certain causes: in this sense, there are many functionaries who may be called thus. But the word in canon law, when used without additions, is understood to mean the bishop, who is the O. of his own diocese, and is competent of himself to do every act necessary for its government, and for ordering of the spiritual concerns of his flock. The jurisdiction of the O. is distinguished from 'extra-ordinary jurisdiction' which arises from some abnormal circumstances, and from 'delegated' jurisdiction which is imparted by the O. to another person to be exercised vicariously.

In English law, the Judge O. is entirely disconnected with the church. In Scotland, the Judge O. generally means the sheriff depute or substitute, who has ordinary jurisdiction in the county.—In those states of the American Union where such an office exists, its functions are assigned by the constitution and laws: in S. C. the office is judicial.

ORDINATE, a. *ŏr'dĭ-nāt* [L. *ordinatus*, regulated, set in order—from *ordĭnem*, order]: well-ordered; regular; methodical: N. in *math.*, a straight line drawn from any point in a curve perpendicular to another straight line called the *abscissa*—the ordinate and abscissa taken together being called co-ordinates.

ORDINATION, n. *ŏr'dĭ-nā'shŭn* [F. *ordination*—from L. *ordĭnātĭōnem*, a setting in order, an arranging]: established order or tendency consequent on a decree; sovereign appointment or allotment (as of God).

ORDINA'TION TO THE MINISTRY: act of setting apart ministers in the Christian church; also the service or ceremony pertaining to the act. The New Testament contains frequent reference to the specific ceremonial of 'imposition of hands' (Acts vi. 1–7, xiii. 1–4, xiv. 23; I Tim. iv. 14, v. 22; II Tim. i. 6). In the Roman, the Greek, and the other Eastern churches, this rite of O. is held to be sacramental, and its exercise is reserved, at least as regards the major orders (see ORDERS, HOLY), exclusively to bishops. In extraordinary cases, it was permitted to cardinals and to certain abbots to confer the minor orders. Considerable controversy exists among Rom. Cath. writers as to the essential portions (*Materia Sacramenti*) of the rite of O. Some place it in the 'imposition of hands,' some in the 'presentation of the instruments' symbolical of each order. The controversy derives some importance from the diversity which exists between the Greek and Roman ceremonial; though Rom. Catholics maintain that the essential rites are contained alike in both ceremonials. As regards the *validity* of the rite of O., the mere fact of its being conferred by a bishop suffices; but there is not any part of the Roman discipline more jealously guarded by laws than the administration of orders. The candidate can be *lawfully* ordained only by 'his own bishop' (*proprius episcopus*), or with the authority of his own bishop, which must be communicated to the ordaining bishop by what are called dimissorial letters. The candidate may be claimed by a bishop as by 'his own bishop' under any of four titles—of birth, of domicile, of benefice, or of connection by personal service; and if an O. be attempted without some one of these titles, heavy ecclesiastical penalties are incurred as well by the ordainer as by the ordained. On the part of the candidate himself, certain qualifications are required; and certain disqualifications created or propounded by the canon law, called *irregularities*, are held to render an O. in some cases invalid, and in all unlawful.

In the Church of England and other Reformed prelatical churches, the rules of the ancient canon-law are retained (with slight modifications in the United States), by which no one could be ordained without previous examination of his fitness, or who was disqualified by bodily infirmity, illegitimacy, immorality, or simony, or who was unprovided with a title (i.e., an appointment to serve in some church) which should provide him with a maintenance; or who, being a canditate for deacon's orders, was under 20, and for priest's, under 24 years of age; but the age for admission to deacon's orders is changed to 23. A college fellowship is admitted as a 'title.' (For the ceremony of O., see ORDINAL.) A person can be ordained only by the bishop in whose diocese he is to serve, except on *letters dimissory* from that bishop to another.

In other Reformed churches O. is performed by the presbytery, or by one or more ordinary ministers. Some small Prot. denominations have no ceremony of O. whatever. See CONGREGATIONALISM: PRESBYTERIANISM: EPISCOPACY: CLERGY: PRIEST: BISHOP: ORDERS, HOLY: ORDINAL: ROMAN CATHOLIC CHURCH: ETC.

ORDNANCE, n. *ŏrd'năns* [an incidental application of *ordinance*, in the sense of arrangement or preparation: F. *ordonner*, to ordain, to dispose: It. *ordigno*, a machine]: general term applied to all things connected with artillery or guns, particularly the great guns; cannon; artillery (see CANNON: FIREARMS: GUN: HOWITZER: MORTAR: RIFLED ARMS: MACHINE GUN: ARMSTRONG, SIR WILLIAM: ETC.). ORDNANCE-MAP, a map made from a portion of the national survey of the country, under the direction of the government: see ORDNANCE SURVEY.

ORD'NANCE, BU'REAU OF: one of the bureaus of the U. S. navy dept.: its head is styled Chief of the Bureau of Ordnance. The bureau is charged with the manufacture or purchase of offensive and defensive arms and apparatus (including torpedoes), ammunition, war explosives, vessels for submarine torpedo service, magazines on shore, and of all machinery, apparatus, and equipment for use with the above. The bureau fixes the location and command of the armament of vessels; distributes the thickness of armor; purchases torpedo boats, and has charge of all their details of whatever nature, and prescribes the armament to be given to all torpedo vessels.

ORD'NANCE DEPART'MENT: one of the departments earliest established under the British crown; abolished by an order in council, 1855, May 25, after an existence of at least 400 years: see BOARD OF ORDNANCE. Its early history is lost in the middle ages. In all wars it was responsible both for management of the *matériel* of the armies, and for direction of the *personnel* of the artillery and engineers. The Department of Ordnance in a very modified form was revived 1870 as a section of the war office, responsible for all supplies and matériel of war.

The ORDNANCE DEPARTMENT in the United States is a military bureau of the war dept.: its head is styled Chief of Ordnance. The functions of the O. D. are to provide, preserve, distribute, and account for every description of artillery, small arms, and all the munitions of war that may be required for the fortresses of the country, the armies in the field, and the whole body of the militia. The O. D. determines the general principles of construction, and prescribes in detail the models and forms of all military weapons: it also prescribes regulations for proof and inspection of these weapons, for maintaining uniformity and economy in their fabrication, for securing their good quality, and their preservation and distribution.

ORD'NANCE SELECT COMMITTEE, under the British Govt.: formerly a committee of scientific officers, to advise the sec. of state for war on all inventions in war matériel. Since 1870, these functions have been fulfilled by officers of the dept. of the director of artillery and stores.

ORD'NANCE SUR'VEY: various operations of the ordnance dept. of the British govt. for preparing maps and plans of the whole kingdom and its parts. The first general map of the country executed by govt. was on a scale of one inch and three-fourths to the m., and completed 1755, but never published. A survey of the whole kingdom with a view to a map, and partly for astronomical purposes, was begun 1784 by measuring a base-line on Hounslow-Heath near London; and some sheets of the survey were published 1796. The publication, however, was very slow, being entirely suspended during the war in the beginning of the 19th c.; also the work was found very inaccurate.—In Scotland, the principal triangulation was begun 1809, and continued with several intermissions, to its completion 1877. In 1824 the survey of Ireland was begun; and a map on a scale of six inches to the m. was completed and pub. 1845 (the first portions revised 1873).—In 1840, surveys for a six-inch map were begun for n. England.

Operations for a map of Scotland, on a six-inch scale, proceeded slowly, amid much public discussion as to the relative value of the one-inch and six-inch scales then in use, and the expediency of adopting a still larger scale. The decision 1855, re-affirmed subsequently (1857,58,61), was in favor of a scale of 1-2500 of nature, or nearly one inch to the acre.

The survey of the United Kingdom is on the following scales: Towns having 4,000 or more inhabitants are surveyed on a scale of 1-500 of the linear measurement, equivalent to 126·72 inches to a mile, or $41\frac{2}{3}$ ft. to an inch; Parishes (in cultivated districts), 1-2500 of the linear measurement, equal to 25·344 inches to a m., or one sq. inch to an acre; Counties, on a scale of six inches to a m.; the Kingdom, a general map one inch to a mile. The sheets of the one-inch map join together, to form a complete map of the whole kingdom. This is true also of the sheets of each county on the six-inch scale, and of each parish on the 1-2500 scale, but the sheets of different counties and parishes are not connected. The 1-2500 scale also applies only to cultivated, populous, and mineral districts; the Highlands of Scotland, and other extensive moorland and uncultivated tracts, being surveyed only on the six-inch scale, and published on the one-inch scale.

For England, the sheets on the scale of 25 inches to a m. (called parish maps) are reduced by photography, and issued on the scale of six inches to a m. (county maps). In all the three kingdoms,.plans of many of the towns on the 10 and 5 ft. scale also are published.

The one-inch map is the most convenient both as a general and travelling map. For general views of the structure of a country, the distribution and relations of its mountains, plains, valleys, and rivers, the one-inch is admitted to be superior to the six-inch; thus better adapted in the first instance for laying out roads, railways, or other extensive public works, or for publication of a general geological survey. On the other hand, such a map is on too small a scale to admit correct measurements of small distances; it is in some respects a generalized picture, and not a correct plan. It has been proposed to use the six-inch maps as a record of sales or encumbrances of land, thus lessening the cost and simplifying the transfer of property. Most of the purposes of the six-inch plans are attained more fully from the 25-inch plans or cadastral survey, which may be used as estate plans, for managing, draining, and otherwise improving land, for facilitating its transfer by registering sales or encumbrances; and as public maps, according to which local or general taxes may be raised, and roads, railways, canals, and other public works, laid out and executed.

Nearly all the states of Europe have produced trigonometrical surveys, many of them of great scientific excellence. All of these have been published, or are in course of publication, on convenient scales; generally smaller than one inch to a statute mile. The most important of these are:

Austria and Northern Italy, scale $\frac{1}{80000}$ or $\frac{4}{5}$ of an inch to a mile.
Bavaria, Baden, Wurtemburg, and the Hessen territories $\frac{1}{80000}$ or $\frac{4}{5}$ of an inch to a mile.
Belgium, $\frac{1}{80000}$ or $\frac{4}{5}$ of an inch to a mile.
Denmark, survey map in preparation.
———, Iceland, surveyed and published on different scales.
France, $\frac{1}{80000}$ or $\frac{4}{5}$ of an inch to a m.; and a reduction to $\frac{1}{320000}$ or 5 m. to an inch.
Great Britain, 1 inch, 6 inches, and, in the lowland districts, 25 inches to a m.; and the coast survey, general charts, $2\frac{1}{2}$ m. to an inch; harbors and bays, from 2 inches to 12 inches to a mile.
Hanover and East Prussia, $\frac{1}{100000}$ or $\frac{7}{11}$ of an inch to a mile.
Italy (see Sardinia, Tuscany, etc.), survey maps of Naples, Rome, etc., in progress.
Greece (French survey) $\frac{1}{288000}$ or $4\frac{6}{11}$ m to an inch.
Netherlands, $\frac{1}{50000}$ or $1\frac{3}{11}$ inches to a mile.
Prussia, $\frac{1}{100000}$ or $\frac{7}{11}$ of an inch to a m., and many smaller.
Russia, survey map in progress.
Sardinia, $\frac{1}{250000}$ or $\frac{1}{4}$ of an inch to a mile.
Saxony, $\frac{1}{57000}$ or $1\frac{1}{9}$ inches to a mile.
Switzerland, $\frac{1}{100000}$ or $\frac{7}{11}$ of an inch to a mile.
Spain and Portugal, surveys commenced.
Sweden and Norway, surveys in progress.
Tuscany, $\frac{1}{200000}$ or about 3 m. to an inch.

The great Trigonometrical Survey of India, begun more than 70 years ago and conducted with great ability, was completed 1880–1 as far as regards the principal triangulation of all India; the maps are published on a scale of $\frac{1}{250000}$ or $\frac{1}{4}$ of an inch to a m.—In the United States, the COAST AND GEODETIC SURVEY (q.v.) is a work of enormous extent, great accuracy, and minute detail. The general coast charts are published on a scale of $\frac{1}{80000}$ or $\frac{4}{5}$ of an inch to a m.; the harbors and ports $\frac{1}{20000}$ or $3\frac{1}{5}$ of an inch to a m.; and a vastly greater undertaking, the triangulation of the whole area of the republic, is in progress (see reference above.)

The Geological Survey is under a different dept. of government (Science and Art). The English survey, begun 1835, is completed on the scale of one inch to a m. (solid geology), and the Drift survey is in process. The Irish survey, begun 1840, is nearly completed. In 1854, the survey was extended to Scotland, and now covers a large part of that country. The surveys are made on the six-inch maps where these exist, but the results are published on the one-inch scale only, except some of the coal-fields, which are issued also on the six-inch scale. Besides the maps, sheets of sections, horizontal and vertical, with valuable memoirs, and monographs on fossils, are published.—A survey of the W. Indies has been carried out, and memoirs descriptive of the geology of Trinidad, Jamaica, and British Guiana have been published. The geological survey of Canada and that of India are vast undertakings in progress.—Nearly all the older states of the Amer. Union have made accurate geological surveys and published excellent geol. maps.

ORDURE, n. *ŏr'dūr* [F. *ordure*, filth, ordure: OF. *ord*, dirty—from L. *horrĭdus*, horrid, filthy: It. *ordura*, filth]: dung; filth; excrements.

ORE, n. *ōr* [Ger. and Sw. *ader;* Norw. *aar;* Dan. *aare*, a vein: another derivation suggested is from AS. *âr;* OHG. *êr;* Goth. *ais;* L. *æs*, brass or bronze, ore; Icel. *eir*, brass—see Skeat and Max Müller]: properly the vein of metal—so called from the ore found in a thin band appearing in the section like a vein running through the rock; a metal as extracted from the earth combined with other substances:—as mixed with mineral matters, ores receive the various names of matrix, gangue, vein-stone, or ore-stone. Any mineral or combination of minerals containing so much metal as to be profitably extracted, is reckoned by miners an ore. The proportion necessary is very various, according to the value of the particular metal and the facility or difficulty of *reducing* the ore. A rock containing only 1 per cent. of iron is never called an ore; one containing the same proportion of gold is a very rich ore. Metals rarely exist in ores in a pure or native state; they are almost always chemically combined with oxygen, sulphur, or other elements.

Ores present themselves in a multiplicity of forms and positions in the solid crust of the earth. Sometimes they are sprinkled through the whole mass of the rocks in which they occur, as is often the case with gold, tin ore, and magnetic iron ore. Sometimes they are deposited in regular parallel beds between the strata of other rocks, as in the case of many iron-stones and of cupreous schist. At other times, they occur in irregular lumps or concretions; or they fill up the fissures of other rocks, forming veins, particularly silver, copper, and lead ores: or lastly, they are found in detritus, gravel, sand, and other alluvial deposits. This last form is evidently the result of disturbance and transport from some of the other positions above specified. And as the metallic parts of the mineral masses or rocks so disturbed and transported are the heaviest, and are insoluble in water, they are more concentrated in these deposits than in their original position, and can therefore be extracted with greater advantage. Such deposits are called *washings*, from the metal being separated from the other débris by the process of washing. Gold and platinum are mostly got in this way in the Ural and Altai Mountains; and gold in California, Australia, and Guiana. Tin ore also is found in alluvial deposits in Cornwall, England, and in India. For the reduction of ores, see **METALLURGY**: also the titles of the several metals.

ORE, n. *ōr* [Dan. *ore;* AS. *ora*—comp. Icel. *eyrir*, eighth part of a mark]: a unit of value in Denmark, Sweden, and Norway; the one-hundredth part of a crown. The coin by this name is of the value of about a quarter of a cent.

OREAD, n. *ō'rĕ-ăd*, plu. **O'READS**, *-ădz*, or **OREADES**, *ō-rē'ă-dēz* [L. *orēăs* or *orēădem*, an Oread: Gr. *oros*, a mountain]: mountain-nymph: see **NYMPH**.

Ö'REBRO: see **OEREBRO**.

ORECTIC, a. *ō-rĕk'tik* [Gr. *orektikos*, pert. to appetite]: of or pertaining to desire or appetite: sometimes used to denote pertaining to the will.

OREDELFE, n. *ōr'dĕlf:* obsolete term for ore underground: also, for a claim on ore resting on ownership of the land where the ore is found.

ORE-DEPOSIT, n. *ōr-dē-pŏz'ĭt:* any metalliferous natural deposit having economical value: the deposit may be of any variety of form or of extent.

OREGON: *ŏr'ĕ-gŏn:* state; one of the **United States** of America; 20th in order of admission into the Union; ranking (1880) 2d in fishery products; name Spanish, meaning 'wild thyme.'

Location and Area.—O. is in lat. 42°—46° 18′ n., long. 116° 33′—124° 25 w.; bounded n. by Wash., e. by Ida., s. by Nev. and Cal., w. by the Pacific Ocean; extreme length e. to w. 360 m., extreme breadth n. to s. 275 m.; 96,030 sq. m. (61,459,200 acres); coast-line 300 m., Columbia-river frontage 270 m.; greatest elevation, Mt. Hood, 11,225 ft. above sea-level; cap. Salem.

Topography.—The Cascade Mountains, continuation of the Sierra Nevada range, divide the state into two parts, e. and w. O. The e. division has an average width of 230 m., is sparsely settled, and its inhabitants are engaged principally in rearing cattle, sheep, and horses. The w. division has average width 120 m., and comprises the most thickly populated and wealthiest portion of the state. From 40 to 70 m. from the coast is the Coast Range of mountains, averaging 3,000–4,000 ft. high, covered with fine forests, and sending numerous streams to the ocean. The Cascade Mountains are about 110 m. from the coast, average 6,000–7,000 ft. high, and have many notable peaks—e.g., Mt. Hood (11,225 ft.), Mt. McLaughlin (11,000), Mt. Jefferson (10,200), and the Three Sisters (9,420). Between the Coast and the Cascade mountains are the Willamette, Umpqua, and Rogue River valleys; and between the Willamette and the Umpqua valleys is the low Callapooia range, from which to the Cal. boundary the surface is diversified by low hills and by valleys, very fertile, and adapted to agriculture, fruit-growing, and grazing. The Willamette valley constitutes the wealthiest portion of O., has an average width of 60 m., length 130 m., and contains about 7,800 sq. m., or 4,992,000 acres, all of which is highly fertile. It is drained by the Willamette river, which receives the Clackamas, Molalla, Pudding, Santiam, and McKenzie rivers, from the Cascade Mountains; and the Tualatin, Chehalem, Yamhill, La Creole, Luckiamute, Mary's, Long Tom, and Callapooia rivers, from the Coast Range. The Columbia is the main river in the state, has a total flow of 2,500 m., drains 395,000 sq. m., is navigable for deep seagoing vessels 120 m. from its mouth, and for river steamers 1,000 m., averages 2 m. in breadth, and is more than 6 m. broad at its mouth. The Willamette river is second in importance, receives the waters of 42 streams, is navigable for ocean steamers 112 m. from its mouth, and for river steamers 250 m., and is the largest tributary of the Columbia. Other important rivers are (n.) Des Chutes, John Day's, Umatilla, and Grande Ronde; (e.) Snake and Owyhee; and (w.) Umpqua and Rogue. In the s. and s.e. are numerous lakes, including the Upper and Lower Klamaths, Goose, Summer, Albert, Warner's, Harney, Malheur, Salt, and Silver lakes.

Climate.—The climate of the w. division is mild and equable; average spring temperature 52°, summer 67°, autumn 53°, winter 39°, average for year 52·75°; wet season Nov. 15—May 1, average rainfall 43·69 in., rain gentle, no torrents, few thunder-storms; hottest month July; days tempered by sea breezes, and nights cool. In the Willamette valley, spring and autumn mornings are foggy, summer warm and smoky, heavy rains in winter; in the Umpqua valley, the climate is delightful, occasional fogs in spring and autumn mornings, mild summer and winter temperature, with occasional showers in summer, rain and occasional snow in winter, and light winds through the year; in the Rogue River valley, many of the characteristics of the Umpqua valley prevail, with warmer summer and colder winter temperature, summer dry, winter with rain and snow; and in the lake region, the winters are very cold, with light rainfall and considerable snow, and the summers are more pleasant and equable. In the e. division, the summers are warm, winters cold, with light rainfall and heavy snow, which is rapidly melted by the Chinook, a warm wind of great benefit to the region.

Geology.—The eozoic, volcanic, tertiary, and cretaceous formations predominate; the first showing in the Coast Range, the second in the Cascade region, the third along the Pacific and in the Willamette, Umpqua, and Grande Ronde valleys, and the fourth in the Des Chutes and John Day's rivers country. For the economic properties of O., see *Mining*, below.

Zoology.—The quadrupeds comprise the grizzly bear, black bear, cinnamon bear, wolf, panther, coyote, catamount, deer, antelope, elk, wild cat, and mountain sheep; with squirrel, raccoon, porcupine, beaver, otter, musk-rat, silver fox, marten, hare, and rabbit among smaller animals. The birds include the Cal. vulture, American swan, Canada goose, turkey buzzard, golden eagle, bald-headed eagle, fish-hawk, cormorant, pelican, gull, albatross, and many song and plumage birds. The leading fish are salmon, cod, halibut, sturgeon, herring, and smelt. Lobsters, crabs, clams, and oysters are abundant.

Agriculture.—In 1880 the farm-lands covered 4,214,712 acres (of which 2,198,645 were improved); comprised 16,217 farms, valued, with fences and buildings, at $56,908,575; contained implements and machinery valued $2,956,173; had live-stock valued $13,808,392; cost for repairs and new buildings $787,047, and fertilizers $10,519; and yielded products valued at $13,234,548. The principal products were: barley 920,977 bushels; buckwheat 6,215; Indian corn 126,862; oats 4,385,650; rye 13,305; wheat 7,480,010; hay 266,187 tons; hops 244,371 lbs.; tobacco 17,325; Irish potatoes 1,359,930 bushels; wool 5,718,524 lbs.; milk 227,540 gallons; butter 2,443,725 lbs.; cheese 153,198. The value of orchard products was $583,663. The live-stock comprised 124,107 horses; 2,804 mules and asses; 4,132 working oxen; 59,549 milch cows; 352,561 other cattle; 1,083,162 sheep;

and 156,222 swine.—In 1885 there were, by state census, 1,243,904 acres under cultivation, and the principal products were: wheat 8,933,718 bushels; oats 6,247,300; barley and rye 1,694,614; Indian corn 273,497; flax-seed 14,262; Irish potatoes 2,650,284; hay 377,822 tons; butter and cheese 3,287,923 lbs.; tobacco 13,207; hops 2,547,378; wool 9,165,830. The live-stock included 165,909 horses; 3,591 mules; 373,247 cattle; 1,636,929 sheep; and 202,612 swine. Umatilla ranked first among the counties in land under cultivation, 208,217 acres, and in production of wheat, 1,401,420 bushels; Linn co. 1st in oats, 1,109,658; Lake co. in barley and rye, 484,058; Union co. in hay, 58,568 tons; Jackson co. in corn, 90,150 bushels; Washington co. in butter and cheese, 337,110 lbs.; Linn co. in flax-seed, 12,278 bushels; Lane co. in hops, 961,081 lbs.; Marion co. in potatoes, 386,038 bushels; Umatilla co. in wool, 1,638,656 lbs., and sheep, 253,717; Union co. in swine, 21,929; Umatilla co. in horses, 22,984; and Grant co. in cattle, 91,996. A state board of agriculture was created by the legislature 1885. Official reports (1888) gave: corn, 161,000 bushels, 7,140 acres, $109,480 value; wheat, 14,548,000 bushels, 892,425 acres, $11,347,440; rye, 17,000 bushels, 1,393 acres, $10,865; oats, 5,441,000 bushels, 209,278 acres, $2,176,400; barley, 1,042,000 bushels, 39.479 acres, $573,235; buckwheat, 11,000 bushels, 813 acres, $7,134; potatoes, 2,092,000 bushels, 19,927 acres, $753,241; hay, 621,314 tons, 477,934 acres, $5,672,597; horses 186,841, value $8,480,719; mules 3,315, $197,958; milch cows 88,730, $2,423,216; oxen and other cattle 762,728, $13,079,341; sheep 2,929,830, $5,622,344; and swine 270,164, $1,153,059.

Manufactures.— O. had (1880) 1,080 manufacturing establishments, employing 3,473 hands, using capital $6,312,056, paying wages $1,667,046, using materials valued $6,954,436, and yielding products valued $10,931,232. The chief industry, according to capital employed, was the manufacture of sawed lumber, which had 228 establishments, employed capital $1,577,875, paid wages $242,154, materials $1,331,342, and received $2,030,463 for products. Next were flour and grist-mill products, 106 establishments, capital $1,286,200, wages $139,882, materials $2,978,714, products $3,475,531. Then followed woolen goods, 10 establishments, capital $566,800, wages $86,088, materials $227,486, products $549,030; foundry and machine-shop products, 16 establishments, capital $260,500, wages $139,022, materials $121,911, products $352,300; tin, copper, and sheet-iron ware, 46 establishments, capital $233,150, wages $64,006, materials $151,475, products $311,650; sash, doors, and blinds, 20 establishments, capital $230,400, wages $71,031, materials $143,980, products $253,692; saddlery and harness, 46 establishments, capital $190,050, wages $63,767, materials $222,350, products $385,350; and slaughtering and meat-packing, 9 establishments, capital $56,800, wages $17,120, materials $205,517, products $264,712.

O. has exceptional advantages for manufacturing establishments, in the extent and diffusion of natural water-power. The falls of the Willamette river at Oregon City alone have a force equal to 1,000,000 horse-power; Salem has a power equal to that of Lowell, Mass.; and paying power is afforded by the three forks of the Willamette, the Upper Columbia, Tualatin, Yamhill, La Creole, Luckiamute, Mary's, Long Tom, Sandy, Hood, Des Chutes, and Link rivers. The wool industry of the state consumes about 3,000,000 lbs. of raw material, and the manufactured goods have annual value of about $2,000,000. The chief mills are at Salem, Oregon City, and Brownsville, and make cassimeres, flannels, and blankets. There are about 150 first-class flour-mills, the largest at Albany, Eugene City, Minerville, Oregon City, Pendleton, Portland, and Salem. Furniture of all sorts is manufactured from native woods, to the amount of $1,000,000 annually. Albany and Salem have flax-mills, and, in both, preparations are in progress to manufacture linen. (See PORTLAND, Or.: SALEM, Or.)

Fisheries.—In 1880 the fisheries of O. employed $1,131,350 capital, 2,795 fishermen, 4,040 shoremen, 1,360 boats, valued at $246,600, $245,750 in minor apparatus and outfits, and $639,000 other capital, including shore property; and received $2,776,724 for general fishery products and $4,300 for seal fishery. In 1885 the salmon product was 3,316 barrels, 483,594 cases, and 404 kits. In 1887 the season was a poor one for several reasons, and the spring pack was 94,000 cases short of that of the previous year. On the Columbia river, the spring pack was 354,000 cases and the fall pack 25,000 cases, 379,000 in all; and the pack of the O. streams s. of the Columbia river was about 100,000 cases—a total of about 479,000 cases, valued at about $2,500,000, yielding the state a revenue of $30,000. On the Columbia river alone, there were 40 canneries, valued at $800,000; 1,400 boats, valued at $245,000; 1,400 nets, valued at $440,000; and other property valued at $200,000—making the total investment nearly $1,700,000; and 6,000 hands were employed during the fishing and canning season. The number of salmon taken from the Columbia river was estimated at 1,200,000, and from other streams within the state 500,000—total 1,700,000; and the amount of fresh salmon consumed or shipped e. was estimated at 2,000,000 lbs. The total pack of the Pacific coast was 987,000 cases, not enough to meet the demands of the market. Fishing is carried on by means of the dip net, gill net, seine, trap, pound net, and wheel, according to the conditions of the various fishing stations. The gill net is used most extensively, both on the Columbia river and on most of the stocked streams s.; the seine is used on all the waters of the state, but most extensively on the s. streams; traps are used infrequently from Astoria to St. Helen's, on the Columbia; pound nets are chiefly confined to Baker's Bay; and wheels are used near the Cascades and The Dalles, in swift water. The fishing season is from May till July.

but the most abundant run in late years has been in the last weeks of the season. Artificial hatching is carried on at several points, to maintain the supply. Three average salmon will fill 48 one-lb. cans. Mountain and lake trout and perch or pike are abundant, but do not constitute, like salmon, a distinct industry.

Ship-building.—In 1880 there were 14 ship building and repairing establishments in O., which employed 85 hands, used capital $63,300, paid wages $77,150, materials $124,400, and received $206,500 for products, which were 2 vessels repaired and 19 new ones built. In 1889 the product of the ship-yards in the customs districts of s. O., Yaquina, Oregon City, and Willamette was: 9 sailing-vessels, 1,252 net tonnage; and 21 steam-vessels, 2,206 net tonnage—total vessels 30, net tonnage 3,458. Among recent productions of note was a steam revenue-cutter for the federal govt.

Mining.—In 1880 the value of all precious mineral products was $1,125,494, and the products were: gold, deep mines, 8,289·8 ounces, value $171,365; placer, 44,811·5 ounces, value $926,366; and silver, deep mines, 15,165 ounces, value $19,607; placer, 6,331 ounces, value $8,186—total gold, 53,101·3 ounces, value $1,097,701; silver, 21,496·2 ounces, value $27,793. The coal product was 43,205 tons, value $97,810; and iron ore 6,972 tons, value $4,669—total non-precious mineral production $102,479. O. ranked 7th in gold, 11th in silver, and 9th in both. The state census (1885) gave coal production 29,600 tons; gold 14,965 ounces; silver 100 lbs. The mineral wealth of O. comprised (1890) 30 distinct minerals and metals, of which gold, silver, iron, platinum, iridium, quicksilver, coal, brick-clay, potter's clay, mineral waters, marble, limestone, sandstone, basalt, and andesite were being mined or otherwise brought into use. The location of the mineral resources by cos. was: Baker, gold, silver, copper, coal, nickel, limestone and marble, cinnabar; Benton, coal, gold, iron pyrites, building stones; Clackamas, iron ore, ochres, gold, copper, galena, coal, building stones; Clatsop, coal, potter's clay, iron; Columbia, iron, coal, salt, manganese; Coos, gold, platinum, iridosmine, brick-clay, chrome iron, magnetic sands; Crook, gold; Curry, iron, gold, platinum, borate of lime, building stones; Douglas, gold, nickel, quicksilver, copper, coal, salt, natural cement, chrome iron, platinum, and iridosmine; Grant, gold, silver, coal, iron; Jackson, gold, iron, quicksilver, mineral waters, graphite, coal, limestone, infusorial earth, building stones; Josephine, gold, copper, sparl, limestone, and marble; Klamath, Lake, Wasco, and Yamhill, mineral waters; Lane, gold, zinc, magnetic iron ore; Linn, gold, copper, galena, zinc blende; Malheur, nitrate beds, alkaline salts; Marion, gold, silver, limestone, bog iron; Multnomah, iron, building stones; Polk, building stones, salt, iron pyrites, limestone; Tillamook, gold, coal, rock salt, iron, iron pyrites, building stones; Umatilla, gold in lodes and placers, coal, iron ore;

Union, gold, silver, hersite, ochre; Wallowa, gold, silver, copper, building stones; and Yamhill, iron pyrites.

Lumber.—It is estimated that 25,000 sq. m., or 16,000,000 acres, of the mountain and coast lands of O. are covered with valuable timber-trees, chief of which are: the Douglas or Oregon pine, yellow fir, black spruce, hemlock, white pine, Oregon cedar, arbor vitæ, yellow cypress, oak, broad-leaved maple, dogwood, arbutus, aspen, and cottonwood. The red fir grows 200 to 300 ft. high, 9 ft. in diameter, and is straight as an arrow, and clear of branches for 150 ft. up. It is the favorite wood in European ship-yards for masts and spars. In 1886 the shipments eastward of cut timber averaged 2,000,000 ft. per month, and 1887–90 about 4,000,000 ft. per month; and the shipments for the Cal. and foreign trade aggregate 75,000,000 to 100,000,000 ft. per annum.

Commerce.—In 1880 O. had 89 steam-vessels, tonnage 31,370·94, value $2,177,000; 38 sailing-vessels, tonnage 7,041·33, value $176,025; 12 barges, tonnage 7,616·60, value $9,600; 88 flats, tonnage 1,970, value $17,000; total craft 227, tonnage 47,998·87, value $2,379,625. 1889, June 30, there were registered in the customs districts of s. O., Yaquina, Oregon City, and Willamette, 148 steam-vessels, 39,543·21 tonnage; 40 sailing-vessels, 5,721·94 tonnage; 8 barges, 5,972·98 tonnage; total craft 196, tonnage 51,238·13. Of these, 6 were registered permanently and 3 temporarily; 124 enrolled permanently and 4 temporarily; and 59 licensed. During the fiscal year ending 1889, June 30, the entrances for the foreign trade at Oregon City and Willamette dists. were: American vessels 46, tonnage 52,550; foreign vessels 162, tonnage 186,490; total craft 208, tonnage 239,040; and the clearances were: American vessels 11, tonnage 11,206; foreign vessels 57, tonnage 54,588; total craft 68, tonnage 65,794. The imports of foreign merchandise aggregated $1,380,454, and the exports of domestic merchandise $6,604,345. O. had 4 U. S. customs districts, and with Alaska and Wash. constituted 1 U. S. internal-revenue district, with headquarters at Portland. Its internal and interstate commerce by railroad and water-routes is large and increasing.

Railroads and Water-routes.—O. is specially favored with facilities for transportation by rail, ocean, and river. The Union Pacific Railroad Company has leased the entire rail and water system of the Oregon Railway and Navigation Company, and thus controls 845 m. of railroad within the state. The Northern Pacific railroad is extended to Portland, which city is now directly connected with St. Paul, Omaha, San Francisco, and New Orleans. Other important lines, operated independently or in conjunction with some of the great trunk-lines, are the Oregon Pacific, the Southern Pacific (lessee of the Oregon and California), and the Portland and Willamette Valley railroads. In 1888 the Union Pacific system alone carried 935,869 tons of freight. O.

has 570 m. of navigable water-front, 300 on the Pacific Ocean and 270 along the Columbia river. The Willamette river is navigable in nearly all seasons 50–60 m. from its mouth, and in the rainy season through the centre of the Willamette valley, 120 m.; and the Yamhill river is navigable in portions of Yamhill, Washington, and Polk counties. The federal govt. expended to 1885 on the construction of a canal and locks at the Cascades, for the improvement of the Columbia river, $955,000, and it was estimated that $750,000 more would be required to open the river to free and uninterrupted navigation. The Union Pacific Railroad Company now operates steamship and steamboat lines on the Upper Columbia, Lower Columbia, Snake, Middle, and Upper Willamette rivers; on Puget Sound, between Tacoma and Victoria and between Seattle and Olympia; and on the Pacific Ocean, between Portland and San Francisco. Ocean steamers also make regular trips between Yaquina and Coos bays and San Francisco; and sailing-vessels carry lumber and freight from various ports and harbors of O. to San Francisco and foreign ports.

Religion.—The Meth. Episc. Church reported (1890): *Oregon Conference*, Eugene City dist., 33 local preachers, 31 churches, 2,633 members, 30 Sunday-schools, 295 officers and teachers, 2,134 scholars, value of church property $51,887, 19 parsonages, value $10,555; Portland dist., 34 local preachers, 56 churches, 4,176 members, 60 Sunday-schools, 593 officers and teachers, 4,351 scholars, value of church property $261,800, 18 parsonages, value $34,600; and in *Columbia River Conference*, The Dalles dist., 29 local preachers, 16 churches, 1,212 members, 25 Sunday-schools, 194 officers and teachers, 1,416 scholars, value of church property $33,350, 13 parsonages, value $9,950—total, 96 local preachers, 103 churches, 8,021 members, 115 Sunday-schools, 1,082 officers and teachers, 7,901 scholars, church property valued at $347,037, with 50 parsonages, value $55,105. The Bapt. Church reported (1890): state convention, Central, Columbia River, Corvallis, Grande Ronde, Middle Oregon, Rogue River, and Willamette associations, 72 ministers, 84 churches, 4,404 members, 58 Sunday-schools, 455 officers and teachers, 3,911 scholars, church property valued at $208,570, aggregate contributions $37,977. The Presb. Church reported (1890): *Synod of the Columbia*, presbyteries of E. Oregon, Oregon, and S. Oregon, 62 ministers, 70 churches, 3,722 members, 63 Sunday-schools, 639 officers and teachers, 4,946 scholars, contributions for congregational purposes $108,477. The Rom. Cath. Church reported (1890): archdiocese of Oregon City (established 1846), 1 abp., 43 priests, 50 churches, 10 chapels and stations, 1 seminary, 2 colleges, 13 academies, 9 parochial schools, 2,040 pupils, 4 charitable institutions, estimated Rom. Cath. population 17,000. The Prot. Episc. Church reported (1890): diocese of Oregon (organized 1889), 1 bp., 19 clergy, 32 parishes and missions, 1,600 communicants, 213 Sunday-school teachers, 1,200 scholars, contributions $29,759. The Congl. Churches reported (1889): 31 ministers, 32 churches, 309 families, 1,447 members, 2,092 Sunday-school members, contributions for home expenditures $24,849. At the sixth international Sunday-school convention, at Pittsburg, 1890, June 24–27, there were reported in O. 290 Sunday-schools, 2,531 officers and teachers, and 20,749 scholars—total membership 23,280.

Education.—In 1880 O. had 59,615 children of school age (4–20 years), of whom 37,437 were enrolled in the public schools, and 26,563 were in average daily attendance. The total cost of maintaining the public schools was $316,885. There were also 8 colleges and universities. In 1885 (state census) there were 1,336 organized school districts, 80,018 children of school age, 46,107 enrolled in the public schools, 31,005 in average daily attendance, 1,701 teachers, 1,291 school-houses, and school property valued at $1,160,433. There were also 44 academies, colleges, and universities. In the school year 1887–8 there were 1,491 school districts, 87,217 children of school age, 58,025 enrolled, 37,406 in average daily attendance, 2,089 teachers, 1,324 school-houses, and school property valued at $1,269,817. State normal schools were maintained at Monmouth (founded 1882); Ashland (1882); Drain (1885); and Weston (1885). There were 1 institution for superior education of women, St. Mary's Hall, at Portland, opened 1869 (Prot. Episc.), and 1 kindergarten school, Oregon Kindergarten Training School, at Portland. Endowed secondary schools (2) for boys were maintained at Portland: Bishop Scott Grammar School, opened 1870 (Prot. Episc.), and St. Michael's College, 1871 (Rom. Cath.); and for both sexes (7), La Creole Academic Institute, at Dallas, 1856 (non-sect.); Drain Acad., Drain, 1880 (Meth. Episc.); St. Scholastica's Convent School, Gervais, 1883 (Rom. Cath.); Grande Ronde School, Grande Ronde (Rom. Cath.); Independent German School, Portland, 1869 (non-sect.); Friends' Pacific Acad., Newberg, 1885 (Friends); and Wasco Independent Acad., The Dalles, 1881 (non-sect.). These combined had 45 instructors, 979 students, 2,140 vols. in libraries, scientific apparatus valued at $1,250, grounds and buildings $176,000, productive funds $27,756, and income therefrom $2,590. The colleges of liberal arts (4) were: Univ. of Oregon, Eugene City, opened 1876 (non-sect.), 9 instructors, 151 students, 2,000 vols. in library, grounds and buildings valued at $77,000, productive funds $210,000, income therefrom $9,000, total income excepting board and lodging $18,000, John W. Johnson, pres.; Pacific Univ. and Tualatin Acad., Forest Grove, 1848 (Congl.), 6 instructors, 100 students, 6,200 vols. in library, grounds and buildings valued at $30,000, productive funds $90,000, income therefrom $8,000, total income excepting board and lodging $10,500, J. F. Ellis, D.D., pres.; McMinnville College, McMinnville, 1860 (Bapt.), 5 instructors, 100 students, 400 vols. in library, grounds and buildings valued at $30,000, productive funds $16,000, income therefrom $1,300, total income excepting board and lodging $2,475, Rev. T. G. Brownson, pres.; and Willamette Univ., Salem, 1844 (Meth. Episc.), 12 instructors, 336 students, 2,800 vols. in library, grounds and buildings valued at $75,000, productive funds $50,000, income therefrom $3,000, total income excepting board and lodging $10,000, benefaction $10,000, Thomas Van Scoy, D.D., president. O. has one school of science endowed with the national land grant, the State Agricultural College, at Corvallis, organized 1872 as a part of Corvallis College (Meth. Episc.). In 1885 the conference of the church offered to transfer the entire institution to the state; the legislature accepted it on condition that its friends would erect a new building; and the corner-stone of a commodious structure was laid 1887, Aug. The college had (1887–8) 5 instructors, 108 students, and a land endowment of more than $100,000, and also receives $15,000 per annum from the federal govt., under the provisions of the Hatch bill. The State Univ. has depts. of law and music, and Willamette Univ. has depts. of law and medicine. O. maintains also a school for deaf mutes, opened 1870, and an institute for the blind, opened 1873, both at Salem. In 1887 a compulsory educational bill was adopted by the legislature and vetoed by the gov.; and in 1889 a bill omitting the features to which the gov. had objected was adopted and approved. The latter bill provides that all school children between 8 and 14 years of age shall attend school 12 weeks in the year, of which 8 weeks must be consecutive. The common-school fund of the state was (1885) $868,735; (1887) $1,059,409; (1889) $1,756,700.

Illiteracy.—Persons 10 years old and upward enumerated (1880) 130,565, unable to read 5,376, unable to write 7,423, whites unable to write 4,343; foreign-born whites enumerated 20,454, unable to write 910; whites 10–14 years old enumerated 18,617, unable to write 1,112, males 687, females 425; whites 15–20 years old enumerated 19,039, unable to write 327, males 218, females 109; whites 21 years old and upward enumerated 81,826, unable to write 2,904, males 1,669, females 1,235; colored persons 10 years old and upward enumerated 11,083, unable to write 3,080; colored 10–14 years old enumerated 367, unable to write 142, males 94, females 48; colored 15–20 years old enumerated 2,065, unable to write 551, males 481, females 70; colored 21 years old and upward enumerated 8,651, unable to write 2,387, males 2,005, females 382.

Finances and Banking.—In 1880 the net state debt was $511,376; co. and school-district $238,352; city and town $98,774—total $848,502; and an assessed real and personal valuation of $52,522,084. 1889, Jan. 1, funded debt none, unfunded $43,955; receipts (1888–9) $2,034,637; expenditures $1,791,258; assessed real and personal valuation (1888) $85,893,429; amount raised by taxation $343,573; tax rate 40 cts. on $100. The special tax for the support of the State Univ. was increased by the legislature (1888–9), and tuition was made free to all youth of the state, and $30,000 were appropriated for the establishment of a state reform school. The State Univ. fund was $48,117; common-school fund $1,756,700; Agricultural College fund $113,139; and univ. land fund $82,206. 1890, Sep., there were 36 national banks (cap. $2,905,000), 12 state banks (cap. of those reporting $1,085,000), 25 private banks, and 5 local fire insurance companies (assets of 4 reporting $1,252,066, liabilities $480.522).

History.—Among the earliest known voyagers to the w. coast of N. America were Cabrillo and Ferrelo, who reached lat. 43° (1543); Apostolos Valerianos, a Greek navigator, better known as Juan de Fuca, who discovered the strait which bears his name (1592); Vizcaino, who passed n. to lat. 43° (1603); Perez, who was at lat. 54° (1774); and Heceta, who, at lat. 48°, saw but did not enter the St. Roque (now Columbia) river (1775)—all representing Spain; Drake (1580), Cook (1778), and Vancouver (1793), representing Great Britain; and Robert Gray (q.v.), who discovered and explored St. Roque river, and changed its name to the Columbia (1791), representing the United States. Further international interest in the vast region was developed by the operations of Russian fur-traders and the exploring expedition sent out by the U. S. govt. under command of Capts. William Clarke (q.v.) and Meriwether Lewis (q.v.), 1805–6. These events led Spain, Great Britain, Russia, and the United States to claim the region on the grounds of discovery or occupation, while France regarded it as an extension of its La. territory. The claims of Spain to exclusive control covered the coast country between lat. 42° and 55° n., and were asserted by a strong naval force. In 1789 Spanish armed vessels seized several English vessels in Nootka Sound (lat. 49° 30′ n.), and war between the two countries was averted by a treaty, 1790, which provided that English trading stations along the sound should be restored, the right of trade by each party guaranteed, and the landing by one party on coasts occupied by the other prohibited. In 1803 the United States, by the purchase of the La. territory, extinguished all French claims to the region; and 1819–22, by the Fla. treaty, the claims of Spain—which all along had been the strongest—were reduced to the region s. of lat. 42° n. Thus the United States and Great Britain remained sole claimants. One of the first results of the Clarke-Lewis expedition was an attempt by John Jacob Astor to open the vast region to settlement, and to render American trade independent of the Hudson's Bay Co., which monopolized English trading interests in Canada, and was striving to control American trade also. He proposed, 1809, to establish a chain of trading posts from the great lakes to the Pacific, to plant a central depot at the mouth of the Columbia river, and to found a line of vessels between the w. coast of America and the ports of China and Japan. In 1811 he sent one expedition by land and another by sea, to seek business intercourse with the Indians along the Pacific coast, and established a fort and trading station at the mouth of the Columbia, since known as Astoria (q.v.). The war between the United States and Great Britain (1812–15) frustrated Astor's plans. His Astoria settlement was surrendered (1813) by his agent (treacherously, he charged) to the English, who renamed it Fort George, and held possession till 1818, when it was surrendered to the United States under the convention of Oct. 20.

The great controversy in regard to the n.w. boundary had its official origin in the second article of that convention, which was drawn to define the boundary between the La. territory and British America. The line was there fixed at lat. 49° n., from its intersection with the Lake of the Woods, to the Rocky Mountains. By virtue of the discoveries and explorations of Gray, Clarke, and Lewis, the United States claimed all the territory drained by the Columbia river (or n. to lat. 52°), and its commissioners were willing to compromise on lat. 49°, to the Pacific; but while the British commissioners agreed to consider that lat. as a basis, they insisted that the boundary-line on it should extend only to the Columbia river, and that from that point to the Pacific the river should form the line. This would have given the present state of Wash. to British America. Failing to reconcile these claims, the convention provided that the territory w. of the Rocky Mountains should be open for ten years to the vessels and subjects of both countries, without prejudice to the claims of either. A second convention (1827) continued the joint occupation indefinitely, but provided that either party might abrogate it by giving the other one year's notice. Dissatisfaction with the settlement of the n.e.-boundary dispute by the Webster-Ashburton treaty, 1842 (see MAINE, *History*), attracted wide attention to the anomalous condition of the 'Oregon country,' and it soon became an important and exciting element in the politics of the day. A treaty agreement with Russia, providing that that country would not extend settlements below lat. 54° 40′, led many people to regard that line as the proper boundary, and gave rise to the memorable political cry, 'fifty-four-forty or fight.' While influential politicians in and out of the congress were demanding the occupation of the whole of O., diplomatic negotiations for a settlement of the dispute were being conducted by the sec. of state and the British minister. 1846, Apr. 23, both houses of congress passed a bill authorizing the pres. to give the year's notice of the abrogation of the joint occupation. On June 6 the British minister agreed to accept lat. 49° as the boundary, to the channel between Vancouver's Island and the mainland, and thence down the middle of the channel and the Strait of Fuca to the Pacific, with free navigation of the channel and the Columbia river to both parties. A third convention was held June 12, the British offer was accepted, and ratifications were exchanged in London July 17. Subsequently a dispute arose over an attempt to determine the true water channel through the centre of which the line was to run. The United States claimed that the real channel was the Canal de Haro, and the British insisted on the Rosario Straits. By the treaty of Washington, 1871, both countries submitted the question to the emperor of Germany for arbitration, and he decided, 1872, in favor of the United States.

The first settlers from other states arrived 1832, and a missionary colony led by Dr. Marcus Whitman and the Rev. Mr. Spalding, appointed by the Amer. Board, made the first organized overland journey to the region 1834. Dr. Whitman soon discovered that the British were intent on preventing American settlements in the O. country; and, making a horseback journey to Washington, he gave information to the govt., concerning the value and accessibility of the region, that had great weight in determining the govt. to retain its possession. The Hudson's Bay Co. had previously spread reports of its inaccessibility, and had sought to discourage American settlements: all such reports were disproved by this ride of the prompt pioneer. Immigration increased steadily till 1848, when the gold excitement began drawing its settlers to Cal.; but the passage by congress, 1850, of the 'donation law,' by which actual settlers could acquire 160–640 acres free, led to the registering of 8,000 claims, and the subsequent discoveries of gold in O. further stimulated settlement. In 1841 the settlers formed a code of laws for their govt., and elected executive officers; 1843 and 4 elected executive and legislative committees; 1845 established a provisional govt.; and 1848, Aug. 14, were given by congress a territorial form of govt. The terr. of O., as organized, comprised all the U. S. territory w. of the summit of the Rocky Mountains and n. of lat. 42°. In 1853 the terr. of Wash. was organized, and comprised the 'district of Vancouver,' or all of O. n. of the Columbia river, toward the w., and of lat. 46°, toward the e. A state constitution was framed 1857, and by act of congress 1859, Feb. 14, the terr. was admitted to the Union as a state, after its e. part (now Ida.) had been annexed to Wash. Terr. Indian outbreaks occurred 1844,47,54,73, and 76.

Government.—The executive authority is vested by the constitution in a gov., elected for 4 years, salary $1,500 per annum; sec. of state, who is also auditor of public accounts, elected for the same term and at the same time, salary $1,500 per annum; state treas., elected for the same term and at the same time, salary $800 per annum; supt. of public instruction, salary $1,800 per annum; and the usual co. officers. The gov. must be 30 years old, a citizen of the United States, and a resident of the state for 3 years preceding his election. In case of his removal, death, resignation, or inability, his duties devolve on the sec. of state; and in case of his removal, death, resignation, or inability, while acting as gov., the executive duties devolve on the pres. of the senate till a gov. is elected. The legislative authority is vested in a legislative assembly, comprising a senate of 30 members, elected for 4 years, and a house of representatives of 60 members, elected for 2 years, salary of each $3 per day and 15 cts. mileage; sessions biennial, in odd-numbered years, limit 40 days. Senators and representatives must be 21 years old, citizens of the United States, and residents of their cos. or dists. one year preceding their election. The judicial authority is vested in a supreme court of 3 justices, elected by the whole state for 6 years, salary of each $2,000 per annum; circuit courts, with judges elected for similar terms; co. courts; co. clerks and sheriffs; and justices of the peace. Jurors are selected from names on the assessment rolls, and out of the number in attendance on the circuit court 7 are chosen by lot, who constitute the grand jury for the term, 5 of whom must concur to find an indictment.—There were (1889, Dec. 21) 607 post-offices in O., of which 1 was first-class, 2 were second, 13 third, 16 presidential, 591 fourth, 86 money-order, and 7 postal-note offices.

The successive govs., with their terms of service, are as follows: *Provisional*—George Abernethy 1845–49. *Terr.*—Joseph Lane 1849; John P. Gaines 1849–53; Joseph Lane 1853; George L. Curry 1853–59, excepting a few days' service, 1854, of J. W. Davis. *State*—John Whittaker 1859–62; Addison C. Gibbs 1862–66; George L. Woods 1866–70; Lafayette S. Grover 1870–77; S. F. Chadwick 1877–8; William W. Thayer 1878–82; Zenas F. Moody 1882–87; Sylvester Pennoyer 1887–91.

Counties, Cities, and Towns.—O. is divided into 29 counties. In 1880 the most populous counties were: Multnomah 25,203; Marion 14,576; Linn 12,676; Wasco 11,120; Umatilla 9,607: 1885 (state census): Multnomah 35,732; Marion 11,848; Linn 11,431; Umatilla 10,920; Lane 10,068; Clackamas 10,035. Cities and towns 1880: Portland 17,577; Astoria 2,803; Salem 2,538; The Dalles 2,232; Albany 1,867; Oregon City 1,263; Baker City 1,258; Corvallis 1,128; Eugene City 1,117: 1890 (census, first report): Portland 47,294; East Portland 10,481; Astoria 7,071; Albina 5,104.

Politics.—State officers elected quadrennially, legislature biennially. The legislature meets first Monday in Jan.; session limited to 40 days. Idiots, insane, convicted felons, U. S. soldiers and sailors, and Chinese are excluded from voting. The state govt. (1888–90) was democratic in gov. and state treas., and republican in sec. of state, supt. of public instruction, and legislature, with a party majority in the latter of 12 in the senate, 42 in the house, and 54 on joint ballot. O. has 3 electoral votes. Her votes for pres. and vice-pres. have been as follows: 1860, Abraham Lincoln and Hannibal Hamlin 3; 1864, Abraham Lincoln and Andrew Johnson; 1868, Horatio Seymour and Frank P. Blair, Jr.; 1872, U. S. Grant and Henry Wilson; 1876, Rutherford B. Hayes and William A. Wheeler; 1880, James A. Garfield and Chester A. Arthur; 1884, James G. Blaine and John A. Logan; 1888, Benjamin Harrison and Levi P. Morton.

Population.—(1850) 13,294; (1860) 52,465; (1865) 65,090; (1870) 90,923; (1880) 174,768; (1885) 204,051; (1890, census, first report) 375,000.

OR'EGON RIVER: see COLUMBIA, or OREGON.

OREGONIAN, n. *ŏr-ĕ-gō'nĭ-an:* resident of the state of Oregon: ADJ. pert. to Oregon.

ORE-HEARTH, n. *ōr'-hârth:* small rectangular blast-furnace, with hearth of cast-iron, used, with slight variations of form, in some countries.

OREIDE, *ō'rē-īd* or *ŏr'īd*, or OROIDE, *ō'rō-īd* or *ō'royd:* new alloy, a substitute for ormolu, which it excels in goldlike character. There are two formulas for composing it. In the first, the ingredients are: copper, 100·0; tin, 17·0; magnesia, 6·0; sal-ammoniac, 3·6; quicklime, 1·80; argol, or unrefined tartar, 9·0. In the second, less brilliant than the former, zinc is substituted for the tin. The metals are first melted; the other ingredients, after being thoroughly incorporated together by powdering and mixing, are slowly added; and the whole is kept in a state of fusion for about an hour, and the scum removed from time to time.

OREILLERE, n. *ō-rā-lyär':* ear-piece of a helmet.

OREILLETTE, n. *ō-rā-lyĕt':* in the *costume of the middle ages*, a portion of the head-dress, worn over the ears or in front of the ears: also, a style of arranging the hair.

O'REILLY, *o-rī'lĭ*, **ALEXANDER**, Count: 1725–1794, March 23; b. Ireland. He went to Spain in early life, entered the military service of that country, and was a soldier in Italy during the war of the Austrian succession. He was with the French army for a brief period, assisted the Austrians in their war with Prussia 1757–8, and then returned to the Spanish army with the rank of lieut.col. He was promoted brig.gen., and stationed at Havana. In 1768 he succeeded Ulloa as gov. of La., which had been ceded to Spain. His cruelty to the French residents made him unpopular; and he returned to Spain, was appointed gov. of Madrid 1773, led an unsuccessful expedition against Algiers 1775, was exiled 1786, and died while on his way to the Pyrenees, to join an army of which he had been appointed commander.

O'REILLY, *o-rī'lĭ*, JOHN BOYLE: 1844, June 28—1890, Aug. 10; b. Dowth Castle, co. Meath, Ireland: journalist and poet. He was educated by his father, a noted mathematician and teacher; learned the printer's trade in the office of the *Drogheda Argus;* worked several years as a compositor and shorthand reporter; joined the Fenians; and at the beginning of the revolutionary movement in Ireland, 1863, enlisted in the 4th hussars, and worked zealously to spread republican principles. The govt., after secretly working 3 years to discover the cause of the insurrectionary proceedings, learned of O.'s part in them. He was arrested for high treason, tried 1866, June 26, found guilty on 5 different charges, and with 4 others was sentenced to be shot. Subsequently this sentence was commuted, first to imprisonment for life, afterward to 20 years' penal servitude. O. spent a year in the prisons at Chatham, Portsmouth, Portland, and Dartmoor, and 1867, Nov., with 340 other convicts, was sent to the penal colony in w. Australia. After various attempts, he made his escape 1869, Feb., landed in Philadelphia Nov. 23, delivered two lectures, and began writing for the press; and became attached to the *Boston Pilot* 1870, of which he subsequently was editor-in-chief and part proprietor. He published *Songs of Southern Seas* (1873); *Songs, Legends, and Ballads* (1878); *Moondyne* (1879); *Statues in the Block* (1881); *In Bohemia* (1886); *The Country with a Roof;* and *The Evolution of Straight Weapons;* and wrote the poem for the dedication of the Pilgrim Monument at Plymouth 1889, Aug. 1. He was an ex-pres. of the Papyrus and Press clubs of Boston, and a member of several in New York.

O'REILLY, Private MILES (*pseud.*): see **HALPINE, CHARLES GRAHAM.**

OREL′: thriving town of Great Russia, cap. of the govt. of O.; on the Oka, at its confluence with the Orlik, 226 m. s.s.w. of Moscow, 678 m. s.s.e. of St. Petersburg. It was founded 1566, as a stronghold in defense of what was then the Russian frontier, against the inroads of the Tartar tribes of the Crimea. Its importance as a fortress ceased after the annexation of Little Russia, and it then became a commercial town. The town owes much to its advantageous position on a navigable river in the midst of the most fertile provinces of Russia. The railway from Moscow to Odessa, on the Black Sea, passes through O., and the Vitebsk line affords direct railway communication with the port of Riga; thus its export trade has been greatly promoted. It is the seat of a bishop, and contains numerous churches; its houses are mostly of wood. There is an important ferry over the Oka. The chief manufacturing establishments in the town are yarn and rope factories. The principal articles of export are cereals and hemp. 1848, June 7, O. suffered severely from a conflagration, which destroyed 1,237 houses, 4 bridges, and a number of granaries. Pop. (1880) 53,500.

OREL, *o-rĕl′*, or Orloff, *ŏr-lŏf′*: government in s.w. central Russia, bounded w. by Little Russia and the govt. of Smolensk; 17,951 sq. m. The surface is flat, with rising grounds in the vicinity of the towns of Kromy and Malo-Archangelsk, from which the Oka and Sosna respectively take their rise. The govt. is drained by the Desna on the w., an affluent of the Dnieper; the Oka on the n., an affluent of the Volga; and the Sosna on the e., an affluent of the Don. The soil is fertile, and the climate mild. The w. part abounds in forests. In the dist. of Briansk, in the n.w., there are iron mines. Agriculture and the cultivation and preparation of hemp are chief employments of the people. Grain is extensively grown, and great quantities are sent to St. Petersburg, Riga, and the Black Sea ports for export. The principal article of export is wheat, in grain and in flour. Sail-cloth, rope and hemp-yarn manufactures are carried on; glass and iron works are numerous. The hemp of O. is reckoned the best in Russia; and the oil from hemp-seed, used in Russia as food, is extracted at 2,000 mills. The rearing of cattle and horses receives great attention; almost all the considerable landowners keep studs. Pop. (1880) 1,826,169.

ORELLANA, *o-rĕl-yâ′nâ*, Francisco: about 1500–45; b. Trujillo, Spain. In boyhood he was a companion of Francisco Pizarro, whom he assisted in the conquest of Peru. He superintended the rebuilding of Guayaquil 1537; and held an important position in the expedition under Gonzalo Pizarro 1539, which explored the country e. of the Andes. The region proving barren, O. was sent with sixty men down the Coca river for provisions. He discovered the Amazon river, and sailed to its mouth, which was reached 1540, Aug. 26. Instead of rendering assistance to the party in whose interest he had been sent, he proceeded to Spain, related his adventures, and obtained from the king a commission to colonize the region that he had discovered. He sailed 1544 with 400 men, but was repulsed by the natives, lost his ships and most of his men, and died soon after reaching the country. The survivors of the expedition settled at Trinidad.

ORELLA′NA River: see Amazon.

ORELLI, *o-rĕl′lē*, Johann Kaspar: philologist and critic: 1787, Feb. 13—1849, Jan. 6; b. Zürich. O. studied in the *Carolinum* at Zürich, and betook himself enthusiastically to the ancient and modern languages and literature. In 1806, he was ordained as a clergyman. He spent some years as a tutor at Bergamo; and published there 1810, two parts of a work, *Beiträge zur Geschichte der Ital. Poesie.* In 1819, he became prof. of eloquence and hermeneutics in Zürich. He took the liveliest interest in the struggles of Greece for freedom, and in the political reformation of his native country. O. edited many classical authors with great learning, and acute discrimination; notably, Horace (2 vols. Zür. 1837–8), Tacitus (2 vols. Zür. 1846–7), Cicero (4 vols. Zür. 1826–31); also (with Baiter) an *Onomasticon Tullianum* (3 vols. Zür. 1836–38): he edited also *Inscriptionum Latinarum Selectarum Collectio* (2 vols. Zür. 1828).

ORENBURG, *ŏ'rĕn-bûrg:* Russian govt. in the Ural region, partly in Europe, partly in Asia; between the govts. of Tobolsk on the n.e. and Samara on the s.w.; 73,600 sq.m. The govt. is divided into four districts—Orenburg, Verchne Uralsk, Ovsk, and Troitsk and Tchelabinsk; cap. Orenburg (q.v.). Till 1865, O. comprised the whole of what is now the govt. of Ufa (q.v.); but in that year the part of O. n.w. of the Ural mountain range was organized into the new govt. The populations, the surface, soils, flora, and fauna of this extensive country are most various. The province is one of the most elevated in the empire; yet it contains extensive low-lying tracts and steppes. It is traversed by numerous navigable rivers, by which and by canals it is in communication with the Caspian and Baltic Seas, and with the Arctic Ocean. The main streams are the Bielaia (running into the Kama, tributary of the Volga), Toboi, Ural. As many as 2,300 larger and smaller lakes lie within the frontiers. Of the whole area, about three-tenths are forest, half is waste land, and only about a twentieth part is cultivated. The inhabitants are Russians, Bashkir, Tartar, and Kirghis tribes, Kalmucks and certain Finnish peoples, with a few Germans. Trade is chiefly with Bokhara, Khiva, Tashkend, and the Kirghis; exports are gold, silver, and other metals, corn, skins, and manufactured goods; imports, cattle, cotton—the demand for and supply of which were greatly increased by the civil war in the United States—and the other articles of Asiatic trade. The imports are either disposed of to Russian merchants in the custom-house on the frontier, or are carried by Asiatic traders into Russia, and sold at the great national market of Nijni-Novgorod. There are numerous iron and copper works, as well as valuable gold diggings, belonging to the crown and to private individuals. The salt mines are valuable. There is a small-arms factory on a large scale, and a few other factories. Cattle-breeding is very extensive. The number of horses in O. is larger than in any other Russian province. The s. frontiers are defended, at intervals of 12 or 15 m., by fortified settlements, inhabited by Cossacks; those on a larger scale surrounded by a bulwark and a moat. This line of forts extends over a frontier of 2,000 m. eastward to the boundaries of China; the series from the mouth of the Ural to the Tobol, known as the O. line, occupied by more than 242,000 Ural and Orenburg Cossacks. The region of which O. forms part was originally called Bashkir-land, and became subject to the Czar of Moscow 1556. Besides the towns giving name to the governmental districts, the only other place of consequence is Mijask. Pop. of the govt. (1880) 1,070,420.

O'RENBURG: town on the e. frontier of European Russia, cap. of the govt. of O., on the river Ural, 1,393 m. s.e. of St. Petersburg. The town, which dates from 1742, suffered from a conflagration 1879. It is the centre of the gov.generalship of the govt. of O., has an excellent custom-house, and has extensive trade with Khirghis and other Asiatic tribes. It imports cotton, silk-stuffs, and shawls from Bokhara, Khiva, and Tashkend; tea (brought mostly on camels) from China; and sheep and cattle from the Cossacks and Khirghis. The sheep are killed in autumn for the fat and skins, which are purchased by Russian merchants. Grain, skins, and metals are principal exports. In the neighborhood is the very rich rock-salt mine of Iletsk. At O. the Ural is frozen from Oct. till March. Pop. (1880) 47,840.

O'RENBURG GUM: exudation from the trunks of larch trees which have been injured by forest fires. It is collected in Siberia and other portions of Russia, and forms an article of export. It is soluble in water, slightly saccharine and resinous, sometimes used for food, and is largely employed as a substitute for gum-arabic.

ORENSE, *ō-rĕn'sā* (anc. *Aquæ Calidæ Ciliorum,* or *Aquæ Originis*): city of Spain, cap. of the province of O., in Galicia, near the frontier of Portugal, on the left bank of the Minho. O. contains interesting ecclesiastical edifices. It is highly reputed for its hot sulphurous springs, *Las Burgos,* which issue—three in number—almost boiling from a granite rock in the w. part of the town. The baths of O. were known to the Romans, and were in repute among the Goths. O. has manufactures of linen, leather, and chocolate, and a large trade in hams, which are in demand throughout Spain. Pop. (1877) 12,586.

OREODAPHNE, *ō-rē-ō-dăf'nē:* genus of trees of nat. order *Lauraceæ,* called sometimes MOUNTAIN LAUREL. The fruit is succulent, partly immersed in a deep thick cup formed of the tube of the calyx. *O. opifera* is native of countries on the lower Amazon. A volatile oil obtained from the bark is used as a liniment, and when kept for a short time deposits a great quantity of camphor.—*O. cupularis* is a very large tree with strong-scented wood, whose bark yields the cinnamon of Mauritius: it grows also in Bourbon and Madagascar.—*O. fœtens,* native of the Canaries, has wood (*Til-wood*) of disagreeable odor. *O. bullata,* found at the Cape of Good Hope, also is remarkable for the disagreeable odor of its wood, the *Stink-wood* of the colonists; but it is hard, durable, beautiful, takes an excellent polish, and is used in ship-building.

ORESTES, *ō-rĕs'tēz:* hero of Greek mythology. The story of his deeds is related by Homer and amplified in the tragedies of Euripides, Sophocles, and Æschylus. He is represented as the son of Agamemnon and Clytemnestra. In obedience to a command of the Delphic oracle he slew his mother and her lover Ægisthus in order to avenge the murder of his father. As a punishment for this crime he lost his reason and was driven by the Furies to various lands. He returned to Delphi and besought assistance from Apollo whose order he had obeyed. The latter was unable to help him, but referred him to Minerva at Athens, where he was tried before 12 judges. Their vote being a tie, the goddess gave the casting vote for acquittal. The Furies were propitiated, and O. succeeded to his father's throne. There are several other versions of the myth.

OR'FA, or **UR'FAH**: see **EDESSA**.

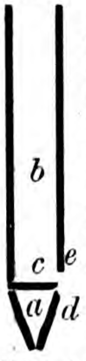
ORFILA, *or-fē'lâ*, **MATEO JOSÉ BONAVENTURA**: physician and chemist, recognized founder of the science of toxicology: 1787, Apr. 24—1853, Mar. 12; b. Mahon in Minorca. His father, a merchant, intended that his son should follow the same pursuit; but young O. showed so strong predilection for the study of medicine, that all thoughts of a mercantile career were dismissed, and he was sent to the medical schools of Valencia and Barcelona, so distinguishing himself in the latter school that the junta of the province resolved to defray the expense of his further education in Paris, on condition of his returning to Barcelona to fill one of the chairs in their medical school: accordingly O. departed for Paris 1807. The junta were prevented from fulfilling the agreement by the outbreak of war with France; but O. made many friends in Paris, and was enabled to continue his studies. 1811, Oct., he received the degree Doctor of Medicine, and immediately began a private course of lectures on chemistry, botany, and anatomy, which, with his successful practice, soon rendered him famous. In 1813 appeared the first ed. of his famous work on poisons, *Traité des Poisons tirés des Règnes Mineral, Végétal, et Animal*, or *Toxicologie Générale* (Paris). The work was commended by the Institute, and rapidly passed through a number of editions. In 1816, he became court physician; 1819, was made a citizen of France, and became prof. of jurisprudence; and 1823, was transferred to the chair of chemistry, to which, 1831, was added the deanship of the faculty. His prosperity was now at the full; his lectures and works were reckoned masterpieces; and his geniality and accomplishments made him a social favorite. From 1834, he was a member of the council of public instruction, and procured the passing of many useful measures, such as the creation of secondary medical schools. He also organized the clinical hospital, founded a new botanic garden, and a museum of comparative anatomy now known by his name. The republic of 1848 ended his career of popular favor; and his chagrin is said to have hastened his death, which occurred at Paris. His great work on toxicology is a vast mine of information, the result of indefatigable research. It is well written, and exhibits the accuracy of language equally with the sound judgment of its author. His other works are of less importance, being mostly compilations; the chief are—*Elémens de Chimie appliqués à la Médecine* (Paris 1817; 8th ed., 1851); *Traité de Médecine Légale* (1823-25; 4th ed., 1847); *Mémoires sur Plusieurs Questions Medico-légales* (Paris 1839). He contributed largely to various journals, dictionaries, encyclopedias, and periodicals. O. both created the science of toxicology and raised it to a high degree.

ORFORD, Earls of: see **WALPOLE**.

ORGAN, n. *ŏr'găn* [F. *organe*—from L. *orgănum;* Gr. *orgănon*, an instrument: It. *organo:* comp. Gr. *ergon*, a work]: a part of the living body by which some action, operation, or function is carried on (see ORGAN—ORGANISM—ORGANIC): an instrument or means of communication, as of a political party—generally said of a newspaper: in *botany*, any defined subordinate part of the vegetable structure, external or internal, as a cell, a fibre, a leaf, a root: wind musical instrument (see below). **ORGANIC**, a. *ŏr-găn'ĭk*, or **ORGAN'ICAL**, a. *-ĭ-kăl*, relating to living organs; produced by living organs. **ORGAN'ICALLY**, ad. *-lĭ*. **ORGAN'ICALNESS**, n. *-nĕs*, state of being organical. **ORGANIZE**, v. *ŏr'găn-īz*, to form, as a living body, with suitable organs; to establish with parts that may co-operate together; to arrange the several parts of a plan of action or work, and appoint the proper persons to carry it out. **OR'GANIZING**, imp. **OR'GANIZED**, pp. *-īzd:* ADJ. formed with organs; constructed of parts co-operating with each other. **OR'GANIZABLE**, a. *-ī-ză-bl*, capable of being organized. **ORGANIZATION**, n. *ŏr'găn-ĭ-zā'shŭn* [F.—L.]: the act of forming or arranging parts in such a manner as to enable them to co-operate together; the parts when so arranged; structure; form. **OR'GANISM**, n. *-ĭzm*, a body possessing an organic structure. **OR'GANIST**, n. *-ĭst*, performer on the organ. **ORGAN-BUILDER**, constructor of organs. **ORGAN-LOFT**, small gallery where the organ stands in some churches. **ORGAN-POINT**, or **PEDAL-POINT**, in *music*, a bass note sustained through a series of chords, with only the first and last of which it is in harmony. The sustained note may be the dominant or tonic, and sometimes occupies an upper part instead of the bass. **ORGANIC BODIES**, such bodies as possess life and sensation. **ORGANIC CHEMISTRY**, that department of chemistry which treats of the composition and properties of bodies that have or have had life; as distinguished from *inorganic* chemistry, which treats of bodies that never had life. **ORGANIC DISEASE**, a disease in which the structure of an organ is evidently affected or altered. **ORGANIC REMAINS**, the fossil remains of animals or vegetables. **ORGANIZED BODIES**, those bodies which possess organs, as animals or plants. (See ORGAN—ORGANISM—ORGANIC.) **ORGANIC LAWS**, laws which form or concern the fundamental parts of the constitution of a state. **ORGANO-**, prefix, relating to or connected with an organ or organs.

OR'GAN: musical instrument played by finger-keys, and in general partly also by foot-keys, and consisting of a large number of pipes of metal and wood, made to sound by a magazine of wind, accumulated by bellows, and admitted at will by the player. It is the noblest and grandest of musical instruments. The following description is necessarily restricted to the most fundamental arrangements of this very complicated instrument. In cathedrals and large churches, the organ comprises four departments, each in most respects a separate instrument with its own mechanism, called respectively the *great-organ*, the *choir-organ*, the *swell-organ*, and the *pedal-organ*. Each has its own clavier or key-board, but the different claviers are brought into juxtaposition, so as to be under the control of one performer. Claviers played by the hands are called *manuals;* by the feet, *pedals.* Three manuals, belonging to the choir, great, and swell organs respectively, rise above each other like steps, in front of where the performer sits; while the pedal-board by which the pedal-organ is played is placed on a level with his feet. A few very large organs have more than three manuals. The condensed air supplied by the *bellows* is conveyed through wooden tubes or trunks to boxes, called *wind-chests,* one of which belongs to each department of the O. Attached to the upper part of each wind-chest is a *sound-board,* an ingenious contrivance for conveying the wind at pleasure to any individual pipe, or pipes, exclusively of the rest. It consists of two parts, an *upper board* and an *under board.* On the upper board rest the *pipes,* of which a number of different quality, ranged behind each other, belong to each note. In the under board is a row of parallel *grooves,* running horizontally backward, corresponding each to one of the keys of the clavier. On any of the keys being pressed down, a valve is opened which supplies wind to the groove belonging to it. The various pipes of each key stand in a line directly above its groove, and the upper surface of the groove is perforated with holes bored upward to them. Were this the whole mechanism of the sound-board, the wind, on entering any groove, would permeate all the pipes of that groove; there is, however, in the upper board, another series of horizontal grooves at right angles to those of the lower board, supplied with *sliders,* which can, to a small extent, be drawn out or pushed in at pleasure by a mechanism worked by the *draw-stops* placed within the player's reach. Each slider is perforated with holes, which, when it is drawn out, complete the communication between the wind-chest and the pipes: the communication with the pipes immediately above any slider being, on the other hand, closed when the slider is pushed in. The pipes above each slider form a continuous set of one particular quality, and each such set of pipes is called a *stop.* Each department of the O. is supplied with a number of stops, producing sounds of different quality. The *great-organ,* some of whose pipes appear as show-pipes in front of the instrument, contains the main body and force of the organ. Behind it stands the *choir-organ,* whose tones are less powerful, and more fitted to accompany the voice. Above the choir-organ is the *swell-organ,* whose pipes are inclosed in a wooden box, with a front of louver-boards like Venetian blinds, which may be made to open and shut by a pedal, for producing *crescendo* and *diminuendo* effects. The *pedal-organ* is placed sometimes entire behind the choir-organ; and sometimes divided, and a part arranged on each side. The most usual compass of the manuals is from C on the second line below the bass staff to D on the third space above the treble staff, and the compass of the pedals is from the same C to the D between the bass and treble staves. The real compass of notes is, as will be seen, much greater.

Organ-pipes vary much in form and material, but belong to two great classes, known as *mouth-pipes* (or *flute-pipes*) and *reed-pipes*. A section of one of the former is represented in the figure. Its essential parts are the *foot a*, the *body b*, and a flat plate *c*, called the *language*, extending nearly across the pipe at the point of junction of foot and body. There is an opening, *d e*, in the pipe, at the spot where the language is discontinuous. The wind admitted into the foot rushes through the narrow slit at *d*, and, in impinging against *e*, imparts a vibratory motion to the column of air in the pipe, the result of which is a musical note, dependent for its pitch on the length of that column of air, and consequently on the length of the body of the pipe: doubling the length of the pipe obtains a note of half the pitch, or lower by an octave. This is the general principle of all mouth-pipes, whether of wood or of metal, but subject to considerable diversities of detail. Metal pipes have generally a cylindrical section; wooden pipes, a square or oblong section. A mouth pipe may be stopped at the upper end by a plug called a *tompion*, the effect of which is to lower the pitch an octave, the vibrating column of air being doubled in length, as it has to traverse the pipe twice before making its exit. Pipes are sometimes half stopped, having a kind of chimney at the top. The *reed pipe* consists of a reed placed inside a metallic, or occasionally a wooden, pipe. This *reed* is a tube of metal, with the front part cut away, and a tongue or spring put in its place. The lower end of the spring is free, the upper end attached to the top of the reed; by the admission of air into the pipe, the spring is made to vibrate, and, in striking either the edge of the reed or the air, produces a musical note, dependent for its pitch on the length of the spring, its quality being determined to a great extent by the length and form of the pipe or bell within which the reed is placed. When the vibrating spring does not strike the edge of the reed, but the air, we have what is called the *free reed*, similar to what is in use in the Harmonium (q.v.). To describe the pitch of an organ-pipe, terms are used derived from the standard length of an open mouth-pipe of that pitch. The largest pipe in use is the 32-ft. C, which is an octave below the lowest C of the modern pianoforte, or two octaves below the lowest C on the manuals and pedal of the organ: any pipe producing this note is called a 32-ft. C pipe, whatever its actual length may be. By a 32-ft. or 16-ft. stop is meant that the pipe which speaks on the lowest C on which that stop appears has a 32-ft. or a 16-ft. tone.



The *stops* of an O. do not always produce the note properly belonging to the key struck; sometimes they give a note an octave, or, in the pedal-organ, even two octaves, lower, and sometimes one of the harmonics higher in pitch. *Compound* or *mixture stops* have several pipes to each key, corresponding to the different harmonics of the ground-tone. There is an endless variety in the number and kinds of stops in different organs; some are and some are not continued through the whole range of manual or pedal. Some of the more important stops get the name of *open* or *stopped diapason* (a term which implies that they extend through the whole compass of the clavier); they are usually 16-ft., sometimes 32-ft., stops; the *open diapason* chiefly of metal, the *close* chiefly of wood. The *dulciana* is an 8-ft. manual stop, of small diameter, so called from the sweetness of its tone. Among the reed-stops are the *clarion*, *oboe*, *bassoon*, and *vox humana*, named from real or fancied resemblances to these instruments and to the human voice. Of the compound stops, a frequent one is the *sesquialtera*, consisting of four or five ranks of open metal pipes, often a 17th, 19th, 22d, 26th, and 29th from the ground-tone. The resources of the O. are further increased by appliances called *couplers*, by which a second clavier and its stops can be brought into play, or the same clavier can be united to itself in the octave below or above.

Organs are now tuned usually on the equal temperament: see TEMPERAMENT. The notation for the organ is the same as for the pianoforte, in two staves in the treble and bass clefs; but in old compositions, the soprano, tenor, and alto clefs are used.

The history of the O. in its early period is greatly indebted to the famous *Syntagma Musicum* of Michael Pretorius—a very rare work, represented in English libraries by only two copies, and tracing the development of the O. from the primitive forms to the largest instruments known at its date of publication (Wittenberg and Wolfenbüttel 1615–20, 4to, 3 vols., appendix of 42 plates). Instruments of a rude kind, comprising more or less of the principle of the organ, seem to have existed in antiquity. Vitruvius (about B.C. 14; transl. by Newton, London 1771-91; Wilkins, London 1813) mentions a hydraulic O., but his description is not very intelligible. The O. is said to have been introduced into church music first by Pope Vitalian I. 666. In 757 a great-O. was sent as a present to Pepin by the Byzantine emperor, Constantine Copronymus, and placed in the church of St. Corneille at Compiègne. Soon after Charlemagne's time, organs became common. In the 11th c., a monk named Theophilus wrote a curious treatise on organ-building. Two very simple forms in the early middle ages were the *regal* and the *positif*, the former so small that angels were sometimes represented playing with the right hand on the keys of the instrument held in the left. A famous O. built for the cathedral at Halberstadt 1361 is described in *Syntagma Musicum*. But it was not till the 15th c. that the O. began to be anything like the noble instrument which it now is. The family of the Antignati, in Brescia, had a great name as organ-builders in the 15th and 16th c. Immense improvements were made in the 16th c.; and in the 17th and the earlier half of the 18th many of the most celebrated instruments on record were made in Germany, Holland, France, and England. For many years the O. in the church of St. Bavon, at Haarlem, built by Christian Müller 1735–38, had the reputation of being the largest in the world. It was 50 ft. broad and 103 ft. high. Those at the church of St. Laurent, Rotterdam, the cathedral at Ulm, and the monastery at Weingarten, were nearly as large. In France, large organs were built for Notre Dame de Paris, the church of St. Eustache, and the cathedrals of Rheims and Toulouse. The best O.-builders in England in the 16th, 17th, and 18th c. were Antony Duddyngton, Thomas Dallam, Robert Dallam, Harris, Bernhardt, Schmidt (naturalized German, known in England as Father Smith, and the most famous O.-builder in London), Ralph Dallam, John Loosemore, Thomas Harris, Renatus Harris, Abraham Jordan, and his son of the same name, Thomas Schwarbrook, Renatus Harris, Jr., John Harris and John Byfield, Sr., Richard Bridge, Parker, John Schnetzler, and Samuel Green.

The Puritanism of the civil war, in its stern reaction against old abuses, doomed organs to destruction; and by an ordinance 1643, Aug. 23, for abolishing superstitious monuments, and a second ordinance 1644, May 9, the demolition or removal of church-organs was ordered for all England; and during 16 years this act was in force. Some organs were removed into private keeping, and some escaped altogether. A portion of the Puritan party declared against the use of any instrument of music in any Christian believer's house; but Cromwell held no such views, and found great content in a fine O. removed from Magdalen College, Oxford, and set up at Hampton Court. At the Restoration 1660, O.-builders of German birth, or who had been in exile abroad, as Schmidt (Father Smith) and his two nephews, were encouraged to renew O.-building in England. Till this time the organs consisted only of flue-stops of the foundation species (except the twelfth), and presented no mixtures, reeds, or doubles, and no pedals. Schmidt's first work 1660 introduced such novelties as compound, flute, and reed stops, and the echo. Ralph Dallam introduced compound and trumpet stops at St. George's 1661. Loosemore, at Exeter, introduced a remarkable feature in the double open diapason, consisting of 14 pipes, some being the largest yet made in England. The temple-O. built by Schmidt, in competition with Harris, had three complete manuals and other notable 'rarityes,' which made it a great success, and led to his building the St. Paul's O., consisting of great and choir organs, and echo, at £2,000 for the inside only, Sir Christopher Wren providing the case. A device of Harris at this time was that of stops made to act 'by communication,' on two different manuals. The O. with which Renatus Harris replaced one built by his father, in Salisbury Cathedral, showed, for the first time in England, 4 manuals, and had 50 stops, including a great-O. of 15 independent stops, a second great-O. of 13 borrowed stops, a choir-O. of 7 stops, and an echo-O. of 11. The Jordans introduced the swell at St. Magnus 1712, but with very limited compass and capacity; and four years later, Schwarbrook adopted at St. Chad's the device of a few treble stops attached to the choir-manual and inclosed in a swell-box. The same artist attached a harp, lute, and dulcimer to his great work at St. Michael's, Coventry; but owing to the difficulty of keeping the strings and action in order, these features were removed 1763. The St. Dionis O. of R. Harris, Jr., was the earliest to contain a French-horn stop, and that of Harris and Byfield the first in England provided with an octave coupler. Parker's O., 1749, was specially remarkable for having four quarter-notes in each octave; and at its opening, Handel conducted the music given. The Lynn O. of Schnetzler was the first to contain a dulciana. It had one in the choir, and one in the swell. The two organs of Green, 1789 and 90, extended the compass of the swell, and inclosed the entire great-O. in a general swell. Pedals, which were known in Germany more than 400 years ago, were introduced into England in an O. made by G. P. England 1790, for St. James, Clerkenwell. They were an octave only in compass. From this date they became frequent. In 1809 J. C. Bishop effected the improvement known as composition pedals, to which has been added the modification known as the fan, adapted to easy alteration of the composition. Bishop introduced also the concussion bellows, 1825, in the O. at the Covent Garden Theatre Royal. This artist's O. at St. James, Bermondsey, was the most complete GG pedal-O., both as to compass and stops, that had then been made. It had a left-hand-side key-board for a third player (the rolling bass part), besides two players at the manuals. In 1827 Joseph Booth used for an O. at Attercliffe, near Sheffield, what he called puff-valves, ingeniously devised to establish pneumatic agency and make the wind-power of the instrument an aid in playing it. In 1832 C. S. Barker invented the pneumatic lever, wishing to apply it to the newly built Yorkminster O., to overcome the difficulties of a touch too heavy for human muscles. Lack of funds prevented his doing anything at York; but 1837 Cavaillé-Coll & Co., great French builders to whom Barker went, adopted the invention for the great-O. that he was building for the abbey church of St. Denis, near Paris. The action of this device relieves the key from the combined resistance of the main pallets, the coupling movements, and the heavy wind-pressure, and permits adjusting the touch to any degree of elastic resistance pleasant to the performer. C. S. Barker, of London, erected in Paris, 1867, an electric O. of his invention, introduced into England, under a patent of 1868, Jan., covering devices for playing the manual and pedal organs, for coupling the various manuals as well as the pedals, either in the unison, or in the octave and sub-octave, and for commanding the large traps in the wind-trunks, known as ventils; to which was later added an arrangement for drawing the stops. In 1868 Bryceson added a perfectly new form of pallet which offers no resistance in opening; and later he made other improvements, including an arrangement for using attenuated air instead of pressure, and at the same time Henry Willis patented a device for using exhaust and power alternately for actuating a 'floating valve' in connection with a novel arrangement of draw-stop action. Among the electric organs erected or reconstructed by Bryceson are those at St. Michael's, Corn-hill, London; St. George's, Tufnel Park; St. Augustine's, Highbury, etc. The pneumatic tubular transmission system, as a substitute for the long tracker movements, etc., in large or separated organs, was turned to practical account first in 1867, in an O. shown at the Paris Exposition. Henry Willis recognized its importance, and used it with improvements in the St. Paul's O. 1874. Bryceson, T. Hill, and others followed. The first piece of mechanism devised for blowing the bellows, and increasing or decreasing the speed of the supply, was the hydraulic engine of Joy and Holt, in which a column of water, admitted alternately to the top and bottom of the piston, is the source of the motion of a cylinder similar to that of an ordinary steam-engine. Thomas Duncan patented the Liverpool water-metre, consisting of two cylinders, with pistons and slotted piston-rods working a short crank-shaft. Gas-engines also are used for blowing organs.

Organ-building in America.—The story of the organ in America begins with the instrument selected by Handel in London, and presented to King's Chapel in Boston by Thomas Brattle 1713. It is said that the prejudice against the organ was such that it was left unpacked more than a year. May it not have been that the unpacking was delayed by lack of a suitably qualified person for putting it in place and tuning it for service? The instrument was small, of a single manual, and with limited compass of pedals. It remained in King's Chapel until 1756, when it was sold to St. Paul's Church, Newburyport, Mass. In 1836 it was transferred to a new field of service, St. John's Church, Portsmouth, N. H. Here it was used in its original form until about 1860, when the available parts of it were incorporated in a more modern instrument by the Messrs. Hook.

The first builders of organs in America all were self-taught. With insufficient examples for inspection, and with no theoretical treatises to guide them, these men evolved organ-mechanism anew, and often hit on clever mechanical devices. They made their own pipes and voiced them by guess, the results being very crude. The first of these enterprising builders was Edward Broomfield, Jr., of Boston, whose work is characterized in the following terms by the Rev. Thomas Price in the ***Panoplist:*** 'As he was well skilled in music, he, for exercise and recreation, has made a most accurate organ, with two rows of keys and many hundred pipes, his intention being 1,200, but died before he completed it. The workmanship of the keys and pipes, surprisingly nice and curious, exceeding anything of the kind that ever came here from England; . . . And what was surprising was that he had but a few times ever looked into the inside work of two or three organs that came from England.' Here we have the whole story between the lines: the builder an amateur, self-taught, working for his own satisfaction. During the revolutionary war, the pipes of the organs were melted for bullets, a circumstance doubly significant—of the little esteem in which the instrument was held, and the desperate straits to which the colonists were reduced. In 1752 Thomas Johnston built an organ for Christ Church, Boston; likewise another for the Episc. church at Salem, with one manual and six stops.

The first regular building of organs in America on a commercial basis was that by William M. Goodrich, whose work was so successful that during his active career as builder, 1805-33, only three foreign organs were imported. One of these, and no doubt the largest, was that imported for Old South Church, Boston, 1822, from the house of Elliot in London. It cost, erected in the church, $7,128. Shortly afterward, Ebenezer Goodrich, brother of the preceding Goodrich, set up in organ-building on his own account. About 1807 Thomas Appleton, apprentice and journeyman with William Goodrich, established an organ factory with Ebenêzer Goodrich. Later the firm name was Hayto, Babcock & Appleton, and their factory was in Milk st., Boston.

In 1827 the first of existing firms was organized, Elias and George G. Hook commencing business in Salem, removing to Boston 1832. In 1855 F. H. Hastings was engaged with them, the firm having already built 155 organs, including many of the largest at that time in the country. The firm of Hook & Hastings was the first to feel the effects of the importation of the great organ for Boston Music Hall 1864. This instrument, built by the firm of Walcker, of Ludwigsburg in Würtemberg, was the largest in the country for many years; and though lacking the facilities of manipulation now in use, it was the first organ heard in America possessing first-class appointment of stops, good string-toned stops made of pure tin or with only slight alloy, and with mechanical appliances representing the condition of the German art at the time. This instrument had more than 100 speaking stops. The progress toward a better style of building was helped by the return of several young Americans from thorough studies abroad—Prof. John K. Paine in 1861, Eugene Thayer about 1867, Dudley Buck 1866, Samuel P. Warren 1865, Clarence Eddy 1872. These masters of the instrument introduced the legitimate music of the German school, and established an entirely different standard of completeness in the pedal-organ especially. Previously, motives of economy had led to the construction of instruments having 'short' stops, running only to tenor C, leaving the bass to be supplied by a single bass-stop, which naturally was too loud for the soft passages, and too soft for the full organ. The pedal frequently had but an octave and a half of compass, even in instruments of considerable size. During this entire period until 1872, the house of Hook & Hastings remained foremost among American builders. Among their largest instruments are those in the Cathedral of the Holy Cross, Boston, three manuals, 83 stops; Music Hall, Cincinnati, four manuals, 96 stops; and Tremont Temple, Boston 1880, four manuals, 65 stops. George H. Hutchins, a very progressive graduate from the Hooks, has also constructed a number of large and fine organs. William A. Johnson, of Westfield, Mass., began organ-building about 1840. He was self-instructed, but had natural genius for the art; and after building in the style then prevalent in this country, began about 1865 to work for a higher standard. He has erected a very large number of instruments, many of them of first-class appointment, tone, and mechanism. Among his best organs are those in Central Music Hall and Second Presb. Church, Chicago. William H. Johnson, son of the preceding, has been associated with his father in the business since about 1860: he is one of the best voicers in the country. The organs of this firm number more than 500. Geo. Jardine & Sons, New York, established 1836, have distinguished themselves by the production of many fine instruments; among the best being that in St. Patrick's Cathedral, New York, 60 stops; St. George's Church, Prot. Episc., New York, 80 stops; Brooklyn Tabernacle (Presb.), 70 stops. Henry Erben (1801–84) established a business in New York 1835, and for nearly half a century held a most distinguished and honorable position among American builders: many large rich-toned organs in New York and vicinity were his work. This enumeration necessarily omits all names except those most widely known; many others were meritorious, but it is believed that none who left a personal mark on the history of the art are here omitted.

The most remarkable chapter in the history of American organ-building is that contributed by the house of Roosevelt, of New York. In 1872 Hilborne L. Roosevelt, a young man with financial means, liberal education, and high ideals, entered on the profession of organ-building, aiming from the first at a high standard rather than immediate commercial success. The works of this house attracted general attention first at the Centennial Exhibition 1876, where a large instrument was heard. The Roosevelt improvements have almost revolutionized the art of organ-building, and have placed the best American instruments above those of any other part of the world in respect to bringing their resources under the control of the organist. The first of these inventions was the Roosevelt wind-chest, having a valve for every pipe, thus affording all the advantages of the German 'poppett' valves, without their defects; rendering the speaking of the organ as prompt as a piano, and the touch of the keys about as light as that of the pneumatic lever. This invention adds materially to the first cost of the instrument, but its advantages and its independence of the weather are likely to make it universal. His next great improvement was a system of 'composition' pistons or pedals, so contrived that any combination of stops can be set upon either piston belonging to the group in a few seconds, and released with equal ease. This device permits the player to arrange a dozen combinations or more, needed in an elaborate piece, and bring them into use as needed, without removing the fingers from the keys, or interrupting the rhythm. He introduced a very ingenious application of electric action, employing it to actuate the valves operating pneumatics, whereby parts of the o1 gan can be widely scattered without impairing promptness of speech or certainty of manipulation. Very remarkable effects are rendered possible by this mechanism, as applied in all the large organs of Roosevelt manufacture. The Roosevelt wind-chest has no 'sliders,' a ventil controlling the admission of wind to the several stops. He therefore employed pneumatic tubes for communicating between the draw-stop and the stop, rendering this part of the action much lighter, as well as prompt, and making it impossible for a stop to be brought only half 'on.' The pneumatic lever, invented by Barker with Cavaillé-Coll 1836, Roosevelt modified by operating it on the exhaust principle, quickening its action. He also instituted an entirely new order in the department of expression. In place of limiting the expressive capacity of the instrument to the stops inclosed in the 'swell-box,' he added swells to the choir and solo organs, and inclosed most of the loud stops of the great organ itself in boxes capable of being operated as swells. In this way the boldness of the tone of the full organ is perhaps somewhat sacrificed, but its softness and capacity of musical effect are very much increased. His voicing has been distinguished for its musical quality and truth to the standard of the several stops. These improvements have met considerable opposition from the older style of builders; but there is little doubt that the organ of the future will contain most or all of them. Roosevelt's theories have had a number of brilliant illustrations on a large scale. Among his more noteworthy works are the organs in the Garden City Cathedral, Long Island (1879–83), having 115 speaking stops, disposed as follows: great-organ, chancel division 18, tower 13, total 31; swell-organ, chancel 14, tower 13, total 27; choir-organ, chancel 10, chapel 13, total 23; solo-organ, tower 7; echo-organ (played from solo-clavier) 7; pedal-organ, chancel 12, tower 5, chapel 2, echo 1, total 20—total 115. Another remarkable work of Roosevelt is in Grace Church, New York, where was a sweet-toned organ by Erben, built 1830, which for its excellence it was desirable to incorporate in the new work. Roosevelt erected a new organ in a room built adjacent to the chancel, with the console in the chancel itself: the echo-organ was placed above the ceiling, connected with the keys by electric action, and by the same means the old organ was brought under control of the organist sitting at the chancel key-board, about 150 ft. away. The total stops of this instrument number 71, and the mechanical accessories are complete. Hilborne Roosevelt died 1888, at the age of 42, having accomplished a greater number of improvements in the mechanism of the organ in his brief career than any other man in the previous two centuries. His work was carried forward by his brother, Frank Roosevelt, whose largest production to date (1890) is the organ in the Chicago Auditorium. All the features mentioned above as peculiar to the Roosevelt system are illustrated in this instrument, probably the most complete concert-organ in the world. It is in seven divisions. The pipes of the great, swell, solo, choir, and pedal organs stand in the organ-chamber at the left of the stage. The echo-organ is above the ceiling. Four stops of powerful intonation are placed in a gallery above the stage, for supporting the chorus in operatic performances, where choral effects are desired. The wind-pressure ranges from three inches to six and one-half inches, the latter being that of the solo-organ. Electric motors actuate the bellows. All the pipes of the swell, solo, choir, and echo organs are inclosed in swell-boxes, as also are most of those of the great. The tone of this instrument is considered as fine as the mechanical appointment is complete.

About 1850 Henry Ward Poole, of Boston, completed one of the most interesting of all attempts, hitherto, at solving the problem of perfect intonation for instruments of fixed scales, and at the same time retaining the control of chromatic relations, modulation, and all the good points of the tempered scale. His instrument proposed to play in perfect tune in all keys as far as five sharps and five flats, and to afford perfect modulation from one key to another without impairing the accuracy of the intonation anywhere. The instrument had 12 keys to the octave, and was played on the principle that a piece of music is always in one key at a time, and modulates to another by passing through a chord common to both keys, the old and the new. The pedal key-board of this organ was arranged in fifths, ascending and descending from middle C. Projecting through the middle of the wooden key was a small brass modulating key, which, being touched, connected the key-board with pipes belonging to the scale of this key. When a modulation was made, the modulating pedal of the new key was pressed while the hands were holding one of these neutral chords, and on coming upon the next following chord the necessary pipes were found connected so that the organ played in perfect tune. Two of these instruments were made by the aid of W. F. Alley, of Newburyport, Mass., enthusiastic organ-builder. The first was erected in the Church of the Unity (the Rev. James Freeman Clarke's), Boston, where it was used ten years; but Mr. Poole having removed to the City of Mexico, there was no person left capable of putting it in order again, and eventually it was taken down and stored, since which it has been lost sight of. The second instrument stood in the factory at Newburyport, never having found a purchaser. It was small, of one manual and about nine stops. The tone was very beautiful, and the value of the improvement may be judged from the fact that the trumpet and open diapason together made an extremely rich and satisfying effect in the full chord of the ninth, which on an ordinary instrument would be intolerable. Mr. Poole made an addition to musical theory by introducing the true harmonic seventh, ratio 7 : 4 to the root, in the full chord of the dominant seventh and ninth—the first time that this chord was ever knowingly used in music. The organ completely solved the problem of perfect intonation so far as relations of fifths were concerned; modulations by thirds, however, were not always perfectly done. No organ-music with obligato pedal parts could be played on it, because of the irregular arrangement of the pedal keys. This feature, however, was not essential, Mr. Poole's theory being that the extreme low notes should be used only for fundamentals of the harmony. The mechanism of the instrument by means of which the changes were made from one key to another (his so-called 'selectors') was very clever. His theories were published at length in Silliman's *American Journal of Science* (2d series, IX., pp. 68–83, 119–216, on 'Perfect Intonation in Music'). In the same periodical, 1867, July, and 1868, Apr., he published two articles on his enharmonic key-board. He died in the City of Mexico 1890.

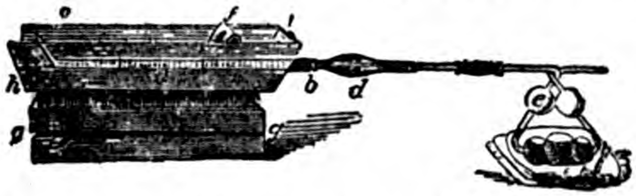
For a full account of the structure of the O., see Hopkins and Rimbault, *The Organ, its History and Construction* (Lond. 1855). Rink's *Praktische Orgelschule*, Leipzig, v. y., is the best work on organ-playing. See also Dr. Stainer's *The Organ* (1877).

ORGAN'IC ANALYSIS: determination of the proximate constituents of a complex organic substance, and determination especially of their qualitative and quantitative composition. When a complex organic substance is submitted to chemical examination, the first point is to determine its *proximate* constituents, i.e., the several definite compounds of which it is made up. Opium, e.g., is thus found to have as its proximate constituents meconic acid, morphia, codeia, and 10 or 12 other substances. The modes by which these proximate constituents are separated are various; the chief being the action of certain solvents such as ether, alcohol, and water, which extract some of the materials and leave others undissolved, Thus ether is the special solvent of fatty and waxy matters, resins, and camphors; alcohol dissolves the same substances with less facility, but on the other hand takes up many substances insoluble in ether; while water, which scarcely acts on the above-named matters, dissolves saccharine, gummy, and starchy matters, and salts of organic acids. The proximate constituents being thus determined, the next point is to determine their qualitative and quantitative (or ultimate) composition; and it is to these processes—especially the last—that the term *organic analysis* is usually restricted.

Qualitative Analysis.—It is known (see ORGANIC COMPOUNDS) that the ordinary ingredients for which we must seek are carbon, hydrogen, oxygen, nitrogen, and sulphur. *Carbon* and *hydrogen* may be simultaneously detected by burning the compound (which must be previously well dried) in a glass tube in contact with oxide of copper, which readily yields up its oxygen. The carbon is thus converted into carbonic acid, which if passed into baryta water forms a white precipitate of carbonate of baryta; and the hydrogen is converted into water, which collects in drops in a small cooled receiver attached to the tube. Carbon may be usually recognized also by the black residue which almost always remains on burning an organic matter, especially in a narrow test-tube in which there is little air. The presence of *nitrogen* may in most cases be readily ascertained by heating a portion of the substance in a test-tube with an excess of hydrate of potash, when a distinct odor of ammonia is perceived. *Sulphur* is detected by igniting the compound with hydrate of potash and nitre, whereby sulphuric acid is formed; and phosphorus and arsenic may be detected by the same means. The presence of *oxygen* cannot, as a general rule, be directly determined.

Quantitative Analysis.—The first attempts to determine the quantitative composition of organic bodies were made more than half a century ago, by Gay Lussac and Thenard. The process originally proposed by them has been modified and improved by various chemists, especially by Berzelius, Prout, and Liebig, and it is owing mainly to the great simplifications introduced by the last-named chemist, and to the consequently increased facility of conducting an ultimate analysis, that knowledge of the composition of organic bodies has so vastly enlarged in recent years.

The operation is always effected by causing complete combustion of a known weight of the body to be analyzed, in such a manner that the carbonic acid and water formed in the process shall be collected, and their quantities determined, from which, of course, the carbon and hydrogen which they respectively contain may be readily calculated. The apparatus required for the analysis of a compound containing carbon, hydrogen, and oxygen only, consists of (1) a *combustion tube*, of hard white Bohemian glass, having a diameter of half an inch or less, and a length of 14 to 18 inches. One end is drawn out in a point and closed, while the edges of the other (or open) end are made smooth by fusion in the blow-pipe flame. (2) A thin sheet-iron furnace, in which the tube is placed and supported during combustion. (3) A small light tube (which may be either a bulb-tube, as in the figure, or a U-tube), which is filled with fragments of spongy chloride of calcium to absorb the watery vapor that is driven through it; and (4) Liebig's bulb-apparatus, containing a solution of potash of specific gravity 1·27, for the purpose of absorbing the carbonic acid. The chloride-of-calcium tube is connected by a well-dried perforated cork to the open extremity of the combustion tube, and by a little tube of flexible caoutchouc, secured by silk cord, to the potash apparatus.



a. b. the combustion tube; *c*, the central portion, in which the mixture to be analyzed is placed; *d*, the bulb-tube, containing chloride of calcium; *ee*, Liebig's potash apparatus; *f*, a movable iron screen; *gg*, bricks supporting *hh*, the furnace.

In performing an analysis a little freshly prepared oxide of copper is first introduced into the combustion tube, then a mixture of about 5 grains of the substance to be analyzed, with an excess of the oxide, while the tube is lastly filled to within an inch of its open mouth with the oxide alone. The tube is then placed in the furnace, which may be heated with charcoal or gas. Red-hot charcoal is now placed round the anterior part of the tube, containing the pure oxide of copper, and when this is red-hot, the fire is slowly extended toward the further extremity by shifting the movable screen shown in the figure. When the tube has been completely heated from end to end, and no more gas is disengaged, the charcoal is gradually removed from the further extremity of the tube, and the point of the latter broken off; after which a little air, freed from moisture and carbonic acid, is drawn through the whole apparatus, to secure any carbonic acid and watery vapor remaining in the tube. The parts are then detached, and the increase of weight of the chloride of calcium tube and of the potash apparatus is determined by an accurate balance. Gas furnaces of various construction have now taken the place of the charcoal furnaces, and several minor improvements and refinements have been introduced, but the method remains in all essential points what Liebig made it. The following analysis of crystallized cane-sugar illustrates this:

	Grains.
Quantity of sugar employed, ...	4·750
Potash apparatus, after experiment. . . .	781·13
" " , before experiment, . . .	773·82
Carbonic acid, ...	7·31
Chloride of calcium tube, after experiment, .	226·05
" " " , before experiment,	223·30
Water, ...	2·75

7·31 grains carbonic acid = 1·994 grains carbon; and 2·75 grains water = 0·3056 grains hydrogen: or in 100 parts of sugar, carbon, 41·98; hydrogen, 6·43; oxygen, by difference, 51·59.

For the methods of determining other elements quantitatively, such as nitrogen, chlorine, sulphur, phosphorus, etc., consult the various works on organic analysis, especially those of Liebig, Fresenius, and Rose.

ORGAN'IC BA'SES: principal elements of organic substances. The remarks following, supplementary to the article ALKALOIDS (q.v.), refer (1) to the classification of organic bases, (2) to their formation.

(1) From the fact that nearly all artificial organic bases are (as shown below) actually constructed from ammonia, and that, whether artificially or naturally formed, they exhibit the property of basicity, which is a leading characteristic of ammonia, chemists have been led to refer organic bases generally to the typical body ammonia, and to regard them as being constructed on or derived from the simple type NH_3. Berzelius believed that all the alkaloids actually contained ammonia as an ingredient of their composition, a view now untenable; and it is to Liebig that we are indebted for the idea that they are derivatives of ammonia; in other words, amidogen bases or ammonia in which an equivalent of hydrogen is replaced by an organic radical. The subject has been thoroughly worked out by Dr. Hofmann, who originally proposed to classify these bodies under the heads *amidogen, imidogen, nitrile,* and *ammonium* bases; but afterward adopted the terms *primary amines, secondary amines,* and *tertiary amines,* in preference to amidogen, imidogen, and nitrile bases—the word *amines* being applied to all organic bases derived from ammonia (NH_3). The amines may be (1) *monamines,* (2) *diamines,* (3) *triamines,* (4) *tetramines,* (5) *pentamines,* according as they are constructed on a single, double, treble, quadruple, or quintuple molecule of NH_3. The present illustrations of the meaning of these terms are confined to the monamines, both because they form the most important group, and because they are much more

readily elucidated than the other groups, which are extremely complicated in their composition. *Monamines* are constructed on the simple type of ammonia, H_3N. In *primary monamines* one of the atoms of hydrogen is replaced by an organic radical, R; hence their general formula is RH_2N. Ethyl-amine $(C_2H_5)H_2N$, or C_2H_7N, is an example. In *secondary monamines* two of the atoms of hydrogen are replaced by two atoms of either the same or different radicals. Hence their general formula is $RR'HN$, where R and R' may be the same or different radicals. Examples are $(C_2H_5)_2HN$, or $C_4H_{11}N$, and methyl-ethyl-amine, or diethyl-amine $(CH_3)(C_2H_5)HN$, or C_3H_9N. In *tertiary monamines* the three atoms of hydrogen are replaced by three atoms of the same or different radicals; their formula therefore is $RR'R''N$, when R, R', R'' may or may not differ from one another. Trimethylamine or $(C_2H_3)_3N$, or C_3H_9N, and methyl-ethyl-phenyl-amine, or $(C_6H_3)(C_2H_5)(CH_5)N$, or $C_9H_{13}N$, afford examples of the radicals being all the same and of their being all different. This last example affords a good illustration of the fact, that though the modern nomenclature of organic chemistry includes long and apparently complex words, these words to a great degree represent the composition of the substance which they are used to indicate; methyl (CH_3), ethyl (C_2H_5), and phenyl (C_6H_5), mainly contributing to form methyl-ethyl-phenyl-amine.

(2) Although all attempts at forming in the laboratory those alkaloids that naturally exist in plants, e.g., morphia, quinia, and strychnia have hitherto failed, a large number of organic bases have been prepared by artificial means, such as: *a.* By the destructive distillation of organic bodies containing nitrogen. Thus, in the preparation of coal-gas, four at least of these compounds are obtained—viz., aniline, picoline, leukol (or quinoline), and pyridine. *b.* By the distillation of certain nitrogenous compounds with caustic potash. In this way aniline is obtained from indigo. *c.* By the combination of ammonia with the aldehydes and with certain volatile oils which possess the properties of aldehydes. Thus acetic aldehyde yields dimethyl-amine, and oil of mustard yields thyosinamine. *d.* By the substitution (by the action of strong nitric acid) of one atom of nitrogen dioxide (NO_2) for one atom of hydrogen in certain hydrocarbons. *e.* By the processes of fermentation and putrefaction. Thus wheaten flour yields by putrefaction trimethyl-amine, ethyl-amine, and amyl-amine. The famous synthesis of urea $CO(NH_2)_2$ may here be mentioned also: see UREA: ORGANIC COMPOUNDS.

ORGANIC COMPOUNDS: Originally restricted to compounds naturally occurring as products of a vital force acting in a more or less complex animal or vegetable organism. It was formerly believed that such compounds could be produced in no other way. At present organic chemistry includes the general consideration of compounds characterized by the presence of carbon and hydrogen, or by being based on such compounds. 'Organic compounds' has therefore a very wide meaning. Wöhler's discovery

(1828) of the formation of urea, the chief and most characteristic organic constituent of urine, from its inorganic isomer (see ISOMERISM), cyanate of ammonia, rendered this view untenable; and it is now known that very many substances which are products of animal or vegetable organisms, may be formed also artificially in the laboratory. Urea may be obtained also by the action of dry ammonia gas on phosgene gas, a body formed by the direct union of chlorine and carbonic oxide; and, to give another example, when carbonic oxide is passed over highly heated, moist caustic potash, direct combination takes place, formiate of potash being formed, which is identical with that prepared by neutralizing caustic potash with formic obtained from ants. Although such cases as that of urea, in which a complex organic product $CO(NH_2)_2$ is produced by the direct union of three inorganic substances (and many other cases of the same nature might be adduced), show that there is no definite line of demarkation between organic and inorganic products, it is convenient to classify chemical compounds according to their natural origin.

The following are leading characteristics of organic compounds: Those which occur naturally rarely consist of more than four elements—viz., carbon, hydrogen, nitrogen, and oxygen—though a few contain sulphur, and possibly (but this is doubtful) phosphorus. By artificial means, however, organic compounds can be formed containing chlorine, bromine, iodine, selenium, tellurium, and many of the metals. Carbon is universally present in both natural and artificial organic compounds. The number of equivalents entering into the composition of organic compounds is usually higher than in the case of inorganic compounds. No instance is known in which an organic compound has been formed by the direct union of its elements in a free state, as many sulphides, chlorides, and oxides (e.g.) are formed in inorganic chemistry.

Organic compounds may be composed of carbon and oxygen, as carbonic oxide, CO; or of carbon and hydrogen, as oil of turpentine, $C_{10}H_{16}$; or of carbon and nitrogen, as cyanogen, CN; or of carbon, hydrogen, and oxygen, as grape-sugar, $C_6H_{12}O_6$; or of carbon, nitrogen, and oxygen, as anhydrous cyanic oxide, C_2N_2O; or of carbon, hydrogen, and nitrogen, as nicotine, $C_{10}H_{14}N_2$; or of carbon, hydrogen, and sulphur, as oil of garlic $(C_3H_5)_2S$; or of carbon, hydrogen, nitrogen, and oxygen, as caffeine, $C_8H_{10}N_4O_2$; or of carbon, hydrogen, nitrogen, and sulphur, as oil of mustard, C_4H_5NS; or finally, of carbon, hydrogen, nitrogen, oxygen, and sulphur, as taurine, $C_2H_7NO_3S$.

ORGANIC RADICALS, or COMPOUND RADICALS (or Radicles, as some chemists write the word): term including a number of groups of elements, of which carbon is always one, which comport themselves chemically like simple elementary bodies. The careful study of organic compounds led chemists to perceive that many of these contained as a proximate constituent a more or less complex atomic group, which in its combining relations behaves precisely like the elementary substances, and which, like them, may be transferred from one compound to another; hence the inference was drawn, that all organic compounds were combinations of organic radicals with oxygen, sulphur, hydrogen, or other elements, or of one organic radical with another. In accordance with this view, Liebig defined organic chemistry as *The Chemistry of Organic Radicals*. To show how much the theory of organic radicals serves to elucidate the composition of organic compounds, and to reduce the laws of organic to those of inorganic chemistry, we will point out some of the chemical analogies between the radical *ethyl* (C_2H_5) and the metal potassium (K), and between the radical *cyanogen* (CN) and the halogen chlorine (Cl). Cy is the symbol for cyanogen.

K_2O	= Potassium oxide.	$(C_2H_9)_2O$	= Ethyl oxide or ether.
KOH	= Potassium hydrate.	$C_2H_5\ H.O$	= Ethyl hydrate or alcohol.
K_2SO_4	= Potassium sulphate	$(C_2H_5)_2SO_4$	= Ethyl sulphate.
KCl	= Potassium chloride.	C_2H_5Cl	= Ethyl chloride.
KS_2	= Potassium sulphide	$(C_2H_5)_2S$	= Ethyl sulphide.
	etc. etc.		etc. etc.

HCl	= Hydrochloric acid.	HCy	= Hydrocyanic acid.
KCl	= Potassium chloride.	KCy	= Potassium cyanide.
NH_4Cl	= Ammonium chloride.	NH_4Cy	= Ammonium cyanide.
$HgCl$	= Mercurous chloride.	$HgCy$	= Mercurous cyanide.
	etc. etc.		etc. etc.

Again. if under certain conditions ethyl chloride is brought into contact with potassium hydrate, the reaction expressed in the following equation occurs:

Ethyl Chloride.		Potassium Hydrate.		Alcohol.		Potassium Chloride.
C_2H_5Cl	$+$	KOH	$=$	C_2H_5OH	$+$	KCl

which shows that the ethyl and the potassium may mutually replace one another in compounds; and the same might be similarly shown of cyanogen and chlorine.

Comparatively few organic radicals have been obtained in isolated state; and in most cases the existence of any special radical is only inferred from the fact, that the group of atoms of which it is supposed to be composed can be transferred from one elementary substance to another, and can be made to enter into combination with other organic radicals. The existence of ethyl was thus inferred long before the substance itself was isolated, and the radical benzoyl, $C_7H_5O_2$, which exists in the oil of bitter almonds. and on which Liebig specially bases his whole theory of organic radicals, has never been isolated.

The organic radicals are either binary or ternary in their composition. Many of them—e.g., ethyl—consist of carbon and hydrogen; others, as carbonyl (or carbonic oxide), of carbon and oxygen; others, as cyanogen, of carbon and nitrogen; and others, like benzoyl, of carbon, hydrogen, and oxygen. Into a few radicals a metallic element enters; these are termed organo-metallic radicals; and cacodyl, which contains arsenic, and is represented by the formula $As(C_2H_3)_2$ is the best example of this class: see **ORGANO-METALLIC BODIES.**

ORGANISTA, *awr-gan-ĭs'ta:* common name of a number of small S. American birds, allied to wrens, and remarkable for sweetness of song. The Peruvian O. (*Troglodytes leucophrys* of Tschudi) has a modest, cinnamon-brown plumage, with head and neck of dark olive. 'The tender melancholy strains, and the singular clearness of the innumerable modulations, charm the ear of the traveller, who, as if arrested by an invisible power, stops to listen.'

ORGANOGENY, n. *ŏr'găn-ŏj'ĕ-nĭ* [Gr. *orgănon*, an instrument; *gennăō*, I produce]: the development of organs from their primitive condition. OR'GANOGEN'IC, a. *-ō-jĕn'ĭk*, pertaining to the development of organs in plants and animals.

ORGANOGRAPHY, n. *ŏr'găn-ŏg'ră-fĭ* [Gr. *orgānon*, an instrument; *graphō*, I write]: a scientific description of the internal structure of plants. OR'GANOGRAPH'IC, a. *-ō-grăf'ĭk*, or OR'GANOGRAPH'ICAL, a. *-grăf'ĭ-kăl*, pertaining to. OR'GANOG'RAPHIST, n. *-ŏg'ră-fĭst*, one who is skilled in describing the internal structure of plants.

ORGANOLOGY, n. *ŏr'găn-ŏl'ō-jĭ* [Gr. *orgănon*, an instrument; *logos*, discourse]: that branch of physiology which treats of organs of animals. OR'GANOLOG'ICAL, a. *-lŏj'ĭk-ăl*.

OR'GANO-LYR'ICON: musical instrument invented by M. de Saint Pern in Paris 1870; consisting of a pianoforte, combined with 12 kinds of wind instruments—bassoon, horns, etc.; with two rows of finger-keys and pedals, and the bellows operated by clock-work and weights.

OR'GANO-METAL'LIC BODIES: term including a large number of chemical compounds in which organic radicals, such as methyl (CH_3), ethyl (C_2H_5), etc., are united to metals. If, e.g., in chloride of zinc $(ZnCl)_2$ we replace the chlorine by ethyl, we produce one of the bodies belonging to this class—viz., zinc-ethyl, $Zn(C_2H_5)_2$. This substance (a good example of the class) may be obtained by digesting a mixture of equal volumes of iodide of ethyl and ether with granulated zinc, at a temperature of about 260°, for several hours. Subsequent distillation gives a mixture of zinc-ethyl and ether, from which the former may be obtained pure by rectification, in the form of a colorless, transparent, mobile liquid, which refracts light strongly, has a powerful but not disagreeable odor, and is rather heavier than water, its specific gravity being 1·182 at 64°. In contact with the air, zinc-ethyl takes fire, burning with a green-edged flame and formation of dense white fumes of oxide of zinc. With the exception of cacodyl, $As_2(CH_3)_4$, these bodies are the creation of recent years, during which numerous compounds of organic radicals with zinc, cadmium, magnesium, antimony, arsenic, bismuth, mercury, lead, sodium, and potassium have been discovered.—For further information, see an article by Dr. Frankland in *The Quarterly Journal of the Chemical Society* Vol. XIII.; also an elaborate article on 'Organo-Metallic Bodies' in Watt's *Dictionary of Chemistry*.

ORGANON, n. *ŏr′gă-nŏn* [Gr. *orgănon*, an instrument]: a body of rules and canons for regulating scientific investigations.

OR′GAN—OR′GANISM—ORGAN′IC: words referring, under various aspects, to the reciprocal relation between a living body as a unity, and its component parts by each of which some distinct action, operation, or function is carried on. The word *organ* (from Gr. *organon*, instrument), is often employed in almost its original sense. But it has received a signification peculiarly its own with which alone the word *organism* is connected, as the designation of any of the functional parts or members of a living body—the *organism* being the living whole, animal or vegetable, which these organs compose. The idea of an organism or of organization is almost as much involved in obscurity and difficulty as that of *life*, with which it is so closely connected. But it is observable that a living body is entirely composed of organs, and these themselves of other organs, until we come to elementary cells; also, that all the parts are mutually dependent on each other; and therefore an organism has been defined as a natural whole, in which all the parts are reciprocally to each other means and end. The juice which nourishes a plant is elaborated by the plant itself, though the supplies are drawn from without. The leaves of a plant are produced by the stem, but re-act upon the stem in promoting its growth. This mutual dependence of parts strongly distinguishes an organism from a *machine*, in which the parts concur for a common end, to which each contributes in its own way, but in which each does not contribute to the support of all or any of the rest. In organisms, moreover, besides this support and maintenance of the different parts or organs, there is provision for the production of new organisms of the same kind, the reproduction or propagation of the species, to which there is nothing analogous outside the sphere of organic life. Among organic beings, as we ascend in the scale from the lowest kinds of plants and animals to the highest, we observe an increasing number of organs and of functions of organs. In the animal kingdom, organic life appears as possessed of sensation and spontaneous motion; while plants are limited to growth, assimilation, and propagation. The question as to the nature of organic processes connects itself with a most difficult question as to the relation of chemical processes with psychical functions, chemical processes being certainly carried on, but singularly modified or directed by the living powers of the organic being.—The term organic is frequently applied to those things in which an analogy is traced to living creatures, in the mutual dependence of parts. Such an analogy may be traced in social life and in political and ecclesiastical life; and the more perfectly this relation of mutual dependence or mutual usefulness is established, the better is the state of things, social or political, or ecclesiastical. Indeed, organism is the type of any and all *living unity;* and the New Test. presents the church, both spiritual and visible, as an organism or organic unity.

It is also the highest praise of a work of art, that it suggests this idea of an organic relation of its parts to each other, and to the whole.—*Organic Laws* are those fundamental or most essential to the system to which they belong.

ORGANZINE, n. *ŏr'găn-zĭn* [It. *organzino:* F. *organsin*]: thrown silk of a very fine texture. The silk, after having been wound off from the cocoons into hanks, is then placed on a winding machine, which reels off the hanks on to wooden reels. These are then placed on spindles, and the fibres of each are made to pass through a minute orifice and small brush, which together clean the thread and remove any knots or projections from it, throwing it at the same time into hanks again. Then the threads of two hanks are taken, and again reeled off, this time on to one hank, being twisted together *to the left;* then two of these doubled reels are taken, and the ends being laid together, are twisted *to the right.* These operations, consisting of winding, cleaning, throwing, and twice twisting and doubling, constitute organzine silk. See SILK.

ORGASM, n. *ŏr'găzm* [Gr. *orgasmos*, softening, moistening]: immoderate excitement or action, as when accompanied by severe spasms.

ORGEAT, n. *ŏr'zhăt* [F. *orgeat*—from *orge*, barley]: a syrup, agreeable to mix in certain drinks, and useful medicinally as a mild demulcent. It is prepared, in the simplest and best of many ways, by making an emulsion of almonds, blanched for the purpose, and beaten into a paste in a mortar, and then rubbed up with barley-water. The proportions are—1 lb. of sweet and 1 oz. of bitter almonds, to a quart of barley-water. To this emulsion are added 2 lbs. of powdered loaf-sugar, and a quarter of a pint of orange-flower water. It is much used in France.

ORGEIS, n. *ŏr'jĕ-ĭs:* the organ-ling, supposed to be so called from the *Orkneys*, on the coast of which it is caught.

ORGIES, n. plu. *ŏr'jĭz*, or MYSTERIES [F. *orgies*, revels—from Gr. and L. *orgĭă*, the rites of Bacchus: Gr. *orgion*, a sacred act; *ergon*, work]: secret rites or customs connected with the worship of some of the pagan deities; as the secret worship of Ceres (q.v.), and the festival of Bacchus, accompanied with mystical customs and wild abandonment to revelry. The name is now applied to drunken revelry and debauchery, particularly by night. ORGIASTIC, a. *ŏr'jĭ-ăs'tĭk*, pertaining to Bacchus or his rites.

ORGILLOUS, a. *ŏr'gĭl-ŭs* [F. *orgueilleux*, proud—from *orgueil*, pride—from It. *orgoglio*]: in *OE.*, proud; haughty.

ORGUES, n. plu. *ŏrgz* [F. *orgue;* Gr. *orgănon*, an instrument]: in *mil.*, thick, long, wooden beams, pointed and shod with iron, hung vertically by separate ropes in the gateway of, and over the entrance to a fortified place: they answer the purpose of a portcullis or door, and are dropped into position by cutting the ropes from which they hang. Their descent is inevitable, in which they possess an advantage over the portcullis, which may be held up by the enemy or blown in by petards, whereas petards have little effect on orgues, for if one beam be destroyed, another can be dropped to fill up the gap. The name has been given also to a sort of infernal machine made of loaded gun-barrels to be discharged in defending a breach.

ORICHALC, or **ORICHALCH**, n. *ŏr′ĭ kălk*, or **OR′ICHAL′CUM**, n. *-kăl kŭm* [L. *orichal′cum;* Gr. *oreichal′kos*, mountain-copper—from Gr. *oros*, a mountain; *chalkos*, brass]: the brass of the ancients; a substance resembling gold in color, but of much less value.

ORIEL, n. *ō′rĭ-ĕl* [OF. *oriol*, a side gallery, a small chamber—from mid L. *oriŏlum*, a little entrance, a corridor]: *anciently*, a small room next the hall in certain houses and monasteries where particular persons dined. **ORIEL**, or **ORIEL WINDOW**, is now a projecting window, generally of a trigonal or pentagonal form; called also Bay-window, Bow-window (q.v.); a large bay or recessed window in a church or in an apartment. It is one of the most picturesque features in mediæval and Elizabethan domestic architecture, and adds to the convenience of the interior. *Note.*—ORIEL, from mid. L. *oriolum*, a small room, a recess, usually thought to have been derived as diminutive from *os, oris*, mouth or opening, is derived by Skeat from L. *aureolum*, gilded or ornamented with gold—from *aurum*, gold, hence a special apartment thus ornamented, a portico, a recess. He also connects ORIEL with ORIOLE.

O′RIEL COLLEGE: in Oxford Univ., England. In 1324, Adam de Brom, almoner of Edward II., procured from the sovereign a charter of incorporation for a college, under the name St. Mary's House, in Oxford. The origin of its name 'Oriel College' is uncertain. It consisted originally of a provost and 10 fellows. The number of fellows was by subsequent benefactions raised to 18, and several exhibitions and scholarships were founded at various times. By the commissioners under 17 and 18 Vict. c. 81, all the fellowships are thrown open, but two are in the mean time suspended for the purpose of increasing the number and value of the scholarships, and of augmenting the salary of the prof. of modern history. By the same authority the scholars are placed on the foundation of the college, a position which previously they had not; the scholarships are made ten in number, tenable for five years, of value £80 per annum, with rooms free. This college was one of the first to throw open such of its fellowships as it could to competition, and hence the fellows of Oriel have long been among the most distinguished men in the university. For several years, however, its undergraduates have done little in the schools. The fellows divide more than £200 a year, in addition to allowances; and the income of the provostship, to which is annexed a living in Essex and a canonry in Rochester Cathedral, is estimated at £2,000 a year. There are 13 benefices in the gift of this college.

ORIENT, a. *ō'rĭ-ĕnt* [F. *orient*, the East—from L. *oriens* or *orien'tem*, the rising sun—from *orīrī*, to rise, to become visible; It. *oriente*]: eastern; bright; shining: N. the East; the part where the sun rises: V. in *surv.*, to mark on a plan the bearings of the compass. O'RIENTING, imp. O'RIENTED, pp. ORIENTAL, a. *ō rĭ-ĕn'tăl* [F.—L.]: eastern; proceeding from Asia or the East—applied to gems, 'valuable; precious'—as opposed to *occidental*, applied to the less valuable: N. a native of Asia or the East. O'RIEN'TALLY, ad. *-lĭ*. ORIENCY, n. *ō'rĭ-ĕn-sĭ*, brightness; richness of color. O'RIEN'TALISM, n. *-tăl-ĭzm*, the doctrines or idioms of the Asiatic nations. O'RIEN'TALIST, n. *-ĭst*, one versed in the languages and literature of Asia; an inhabitant of the eastern parts of the world. O'RIENTA'TION, n. *-tā'shŭn*, the process of determining the east point in taking bearings. In modern ecclesiology, the term has (besides a special application as below) a general application to placing toward the east, as the altar of a church. As Christians from an early period turned their faces eastward when praying, so Christian churches were usually placed east and west, in order that the worshippers, as they looked toward the altar, might look also toward the east. Modern observation, however, has found that few ancient British churches stand exactly e. and w., the great majority inclining a little either to the n. or to the s. This deviation from the true east has received, among English ecclesiologists, the name of 'Orientation.' Its origin or cause has not been satisfactorily explained. Some have supposed that the church was turned not to the true east, but to the point at which the sun rose on the morning of the feast of the patron saint. But, unfortunately for this theory, neighboring churches, dedicated in honor of the same saint, have different orientations. Thus, All Saints' at West Beckham, in Norfolk, points due e.; while All Saints' at Thwaite, also in Norfolk, is 8° n. of east. There are instances, too, in which different parts of the same church have different orientations; the chancel and the nave built in not exactly the same line; e.g., York Minster and Lichfield Cathedral. Another theory is, that orientation 'mystically represents the bowing of our Savior's head in death, which Rom. Cath. tradition asserts to have been to the right (or north) side.' But this theory is gainsaid by the fact, that the O. is as often to the s. as to the n. Until some better explanation is offered, it may be held, that orientation (in this special sense of deviation) has had no graver origin than carelessness, ignorance, or indifference. See EAST.

O'RIENT, THE THREE KINGS OF: see MAGI.

ORIFICE, n. *ŏr'ĭ-fĭs* [F. *orifice*—from L. *orĭficĭum*, an opening, an orifice—from *os*, a mouth, *oris*, of a mouth; *facĭō*, I make: It. *orificio*]: a mouth or aperture, as of a pipe or tube; any opening.

ORIFLAMME, n. *ŏr'ĭ-flăm*, or **Auriflamme**, *aw'rĭ-flăm* [F. *oriflamme*—from mid. L. *auriflamma*, golden flame, golden banner, the standard of the monastery of St. Denis in France—from L. *aurum*, gold; *flamma*, a flame]: ancient royal standard of France, borne on a gilded lance, and consisting of a red flag deeply split at one end to form flame-shaped, pointed streamers. Originally this banner of the Abbey of St. Denis was borne by the Counts of Vexin, patrons of that church; but after the county of Vexin fell into the hands of the French crown, the O. became the principal banner of the kingdom. It was charged with a saltire wavy or, with rays issuing from the centre crossways. In later times the O. became the insignia of the French infantry. The name seems also to have been given to other flags; according to Sir N. H. Nicolas, the O. borne at Agincourt was an oblong red flag split into five parts.

ORIGAN, n. *ŏr'ĭ-găn*, and **Origanum**, n. *ŏr-ĭg'ă-nŭm* [F. *origan*—from L. *orĭgănum;* Gr. *origanon*]: the wild marjoram; the mountain-joy, in reference to its habitat on open hilly ground; the *Origanum vulgārĕ*, ord. *Labĭātæ*.

ORIGEN, *ŏr'ĭ-jĕn*, or **Origenes**, *ŏ-rĭj'ē-nēz*, called *Adamantinos* or *Chalchentezos*—both epithets expressive of his firmness of purpose and unflinching assiduity: about 185—about 254; b. prob. at Alexandria: one of the most eminent of the early Christian writers, 'the father of biblical criticism and exegesis in Christendom.' His father, Leonidas, seems to have held some superior office in the church. O. received a most liberal education. While, on the one hand, he was initiated at an early age into Hellenic science and art, Christianity was instilled into his mind by men like Pantænus and Clemens of Alexandria. During the persecutions against the Christians, instituted by Septimus Severus, his father died the death of a martyr, and O., then 17 years of age, would have shared it of his own free will, had not his mother, left unsupported with six children, prevented him. After a short time his zeal and erudition procured for him the office of catechist in the Alexandrian church; but no salary being affixed to it, he was fain to dispose of his much-loved collection of classical authors for a daily stipend of four oboli (about four cents) for several years. His wants were extremely limited, and his asceticism led him even to self-mutilation (in accordance with his erratic interpretation of Christ's words in Matt. xix. 12): an act for which he afterward expressed deep sorrow, and which became a dangerous weapon in the hands of his antagonists. Not a few of his hearers being masters of Greek (Neo-Platonic) philosophy, O., to ward off more successfully their attacks on his doctrines, and to combat them on their own ground, applied himself particularly to this science, and Ammonius Saccas himself is said to have been his teacher. From this period also may be dated O.'s transition from unconscious to conscious belief. He examined henceforth, with as little prejudice as possible, all the different systems of human speculations that came under his notice during his many journeys; proceeding on the principle 'that we are not, under the pretense of piety, to pin our faith on that which is held by the multitude, and which therefore alone seems to stand on high authority, but on that which results through examination and logical conclusions from established and admitted truths.' This liberality of his mind and doctrines could not fail, on the one hand, to bring about many conversions to the faith, as he taught it, among both 'pagans' and 'heretics,' the latter chiefly of the Gnostic sects; and on the other hand, to raise an outcry among less liberal teachers of the faith, who had not been so successful in their labors. What gave greatest offense in his teachings was his way of explaining, after the manner of the Midrash, known to him through the Jewish masters (from whom, at an advanced age, he had also learned Hebrew), allegorically and symbolically that which in the Scripture warred with the common human understanding, or seemed repugnant in manner or matter. Furthermore, while upholding all the ethical portions of the Bible, he rejected much of its supposed historical and legal contents for all purposes, except, perhaps, as starting-points for homiletics. 'What edification,' he says, 'could we find in literally interpreting the story of Abraham's first telling Abimelech a lie, and then, with Sarah's consent, handing her over to him and prostituting her?' As to the discrepancies in the different gospels respecting the life of Christ, he says: 'One of two only is possible. Either these things are true in a *spiritual* sense only, or as long as the discrepancies are not satisfactorily explained away, we cannot believe in the gospels being dictated by the Holy Spirit, and redacted under the influence of his inspiration.' In the view of modern scholarship—even of that unfriendly to Christianity—O.'s alarm was needless and his concession more than the case demanded: the discrepancies disprove not the substantial historical verity of the gospels, but only the mechanical theory of their exact verbal dictation by the Holy Spirit.'

In 211 O. went to Rome, but soon afterward, at the wish of Bishop Demetrius, he returned to Alexandria, which, however, he was obliged to leave precipitately, and to seek refuge from certain popular tumults in Palestine. Here the bishops received him with great honors, and requested him to institute public lectures, in which they themselves became hearers. Recalled again by the Alexandrian bishop, he was sent to Achaia to combat certain heresies that had broken out there. The wrath that had silently been gathering against him found its first vent when, in 228, the bishops assembled in Cæsarea in Palestine consecrated him presbyter. The Bishop of Alexandria took umbrage at this outrage, as he called it, on his authority. Two councils were convoked, and in 232, O. was deprived of his priestly office, and excommunicated, the principal heresy charged against him being his denial of eternal punishment. Yet the churches of the East adhered faithfully to him. Palestine, Arabia, Phœnicia, and Achaia remained in constant communication with him; and men like Gregory Thaumaturgus (q.v.). Athenodoros, and others, remained or became his faithful disciples, while the Bishop of Cæsarea allowed him openly to expound the Scripture in his church. The persecutions under Maximinus again forced him to seek refuge for two years in Cappadocia. Returning under Gordianus, he resumed his labors and journeys, until, when Decius ascended the throne, he was seized, imprisoned, and tortured for his faith. He did not survive his sufferings long, but died at Tyre, where his tomb, near the high altar of the cathedral, was shown for many centuries, until it was destroyed during the Crusades.

The number of his works is stated by Epiphanius and Rufinus to have exceeded 6,000, and though this is probably meant as only an exaggerated round number, yet the amount of writings that issued from his always busy brain and hands cannot but have been enormous. Seven secretaries and seven copyists, aided by an uncertain number of young girls, are by Eusebius reported to have been always at work for him. The great bulk of his works is lost; but among those that have survived, the most important by far are his two editions of the Old Testament, called respectively *Tetrapla* (*four*fold) and *Hexapla* (*six*fold): see HEXAPLA. The labor bestowed on this work must have been immense, and no less than 28 years is O. supposed to have been engaged in it. On its importance for biblical criticism it is needless to enlarge here. Fragments only have come down to us, the original having been lost during the siege and capture of Cæsarea by the Arabs; and the Greek as well as the Roman clergy having almost laid an interdict upon the copying of any of O.'s much suspected writings. Montfaucon has collected and edited these fragments (*Hexaplorum Origenis quæ supersunt*, 2 vols. fol. Paris 1714), which were re-edited by C. F. Bahrdt (1769–70). Of O.'s other partly extant, partly lost works, the chief are his books 'On the Resurrection,' 'On Martyrdom,' 'Eight Books against Celsus' 'On Prayer,' besides Epistles, etc. He further revised and enlarged Philo's Lexicon of Hebrew Names (*Hebraicorum Nominum S. Scripturæ et Mensurarum Interpretatio*), whence it has often, together with many other spurious works, been ascribed to him exclusively. Little also has survived of his many exegetical writings, commentaries, brief notes, and homilies on both Testaments. The best editions of his collected works are by De la Rue (Paris 1733; 2d ed. 1856); by Oberthür (1785, 15 vols.); and by Lommatzsch (Berlin 1831–48). See works on O. by Thomasius (1837) and Redepenning (1846); also Herzog.

ORIGIN, n. *ŏr′ĭ-jĭn* [F. *origine*—from L. *origīnem*, origin, descent—from *orīrī*, to rise, to become visible: comp. Gael. *ur*, light, fire]: first existence or beginning; derivation; cause; root; source. ORIGINAL, a. *ō-rĭj′ĭ-năl*, first in order; preceding all others; primitive; having the power to originate new thoughts or ideas; not copied: N. that which precedes all others of its kind; fountain; source; that from which anything is translated, transcribed, or copied. ORIG′INALLY, ad. *-lĭ*, primarily; at first. ORIG′INAL′ITY, n. *-năl′ĭ-tĭ*, the power or faculty of producing new thoughts, or rare combinations of thought. ORIGINATE, v. *ō-rĭj′ĭ-nāt*, to bring into existence; to take existence; to cause to be; to begin; to produce what is new. ORIG′INATING, imp. ORIG′INATED, pp. ORIG′INATOR, n. *-nā-tėr*, one who originates. ORIG′INA′TION, n. *-nā′shŭn*, the act of bringing or coming into existence; first production; mode of production or bringing into being. ORIGINAL SIN, the innate depravity and tendency to evil in the human mind; the result of our first parents' sin (see below).—SYN. of 'origin': beginning; foundation; fountain; commencement; rise; spring; birth; occasion;—of 'original, a.': primary; pristine; first.

ORIG′INAL SIN, DOCTRINE OF: theological tenet, which, in its extreme form, presents man as coming into the world with the reason and will utterly corrupt; this corruption originated in the fall of Adam, and has been inherited equally by all his posterity, so that the natural man is not only incapable of knowing and loving God and goodness, but is altogether inclined to contemn God and pursue evil; on which account, the anger of God has subjected man to temporal death, and destined him to everlasting punishment in hell; from which penalty there is salvation for only the fixed number of the elect—to whom God, according to His eternal decree, grants a new nature—or, in a different phase of doctrine, for those new-born by baptism. From this extreme, the doctrine has been variously modified and softened. The tenet is founded on the account of the fall given in Genesis, and on some passages in the apostle Paul's Epistle to the Galatians and in that to the Romans; which passages, however, are held by others to contain no such doctrine; and, indeed, nearly every point in the history of this tenet is the subject of as much controversy as the details of the doctrine itself. The early church, it is maintained by one school, was unacquainted with it; and even the most orthodox admit that the doctrine had not at that time been fully developed. The Christian Fathers, Justin Martyr, Clemens Alexandrinus, Irenæus, and others, ascribe to the natural man a certain ability to know God and choose the good: it is asserted that they reject distinctly all propagation of sin and guilt, and even refer human mortality not to Adam's sin, but solely to the constitution of the body. Origen, on the other hand, in opposition to the Gnostics and Manichees, who grounded the sinfulness of men on the connection of the soul with a material body, asserted that the sinfulness was in existence at birth, but ascribed the development of actual sins and their consequences not to propagation, but to the moral operation of precept and example. He accordingly found the cause of sin to be in the freedom of the will, the abuse of which he explained partly by the operation of evil powers, partly by the predominance of the sensuous part of man's nature over the rational mind. The orthodox teachers of the Greek Church held that Adam, by the fall, rendered himself and all his posterity mortal; but, according to the less rigid schools, they sought the origin of sin in the freedom of the will acted upon by the flesh and by demoniacal influences, and ascribed to man the power of resisting every evil, if he chose. These views, it is alleged, continued to be held, in substance, by the Christian teachers in the east, and were fully developed by Chrysostom; but Rom. Cath. writers maintain that in all this Chrysostom and the other Greek Fathers are speaking not of the *natural* powers of the will, but of the will as assisted by Divine grace.

The doctrine took another shape in the Latin Church. Tertullian, following up his dogma of Traducianism, according to which the child derives not only its body, but also its soul, from its parents, maintained that sinfulness had been propagated, together with mortality, from Adam to all mankind; he thus defended an *originis vitium*, without conceiving it as actual sin and without denying all capability for good in man. This view was followed by Cyprian, Ambrose, and even by Augustine in his earlier writings. It was only during his controversy with Pelagius and Cælestius that Augustine came to develop the doctrine of original sin into the full form first stated above. His great influence in the western churches procured the condemnation of his opponents, the Pelagians (q.v.), as heretics, at the Councils of Carthage (412, 416, 418), though the Councils of Jerusalem and Diospolis (415) decided in their favor. Building upon the foundation of Traducianism, Augustine laid down that every natural man is in the power of the devil, and upheld the justice of this as a punishment for the share which the individual had in Adam's transgression; for as all men existed in the loins of Adam, all sinned with him. Pelagius, on the other hand, who rejected the Traducian theory, denied that sin is propagated physically, or that the fall of Adam has exercised any prejudicial influence on the moral constitution of his posterity; and maintained that all men are born in a state of innocence, possess the power of free-will, and may therefore live without sin. He and his followers objected to Augustine, that his doctrine was in direct contradiction to clear passages of Scripture, and that it made God the originator of evil and an unrighteous judge.

Great as was the respect for Augustine, the harshness of his doctrine was too shocking to the natural sentiments to find lasting acceptance. In the Eastern Church it never gained footing, and even in the west it met opposition. In Gaul, John Cassian, Faustus, Arnobius, and others, held a view midway between the views of Augustine and Pelagius; wherefore they were called Semi-Pelagians. They attributed to man a capacity for good which makes it possible for him not indeed to merit the favor of God, but to make himself capable of receiving it; and maintained that it is only a certain inborn weakness that men inherit from the first pair. The Semi-Pelagian doctrine found acceptance especially among the monks (in particular among the Franciscans), and continued to prevail during the middle ages, finding, among the scholastics, partisans in the Scotists. Augustine's views also found advocates among the scholastic philosophers, who, however, added many limitations and explanations. Regarding the way in which original sin is propagated, many held by the Traducian theory; while others conceived it to be a sort of infection of the soul by the defiled body, or an imputation of guilt to all partakers of the human nature. Petrus Lombardus adhered to Augustine. Anselm of Canterbury conceived original sin to be a want of requisite righteousness, and thought that this want was imputed to all the posterity of Adam, though not in the same degree as if they themselves had sinned. Anselm's view was adopted by Duns Scotus; while Bonaventura and Thomas Aquinas sought to combine the opinions of Anselm and Augustine. Anselm had thought that his theory afforded a better explanation of the sinless birth of the Lord Jesus; and about the 12th c. it began to be maintained that the Virgin Mary also was conceived without sin.

The reformers of the 16th c. everywhere made original sin a leading doctrine, and thus were enabled to combat effectively the Rom. Cath. doctrine of the merit of works; while the Rom. Cath. Church, in the fifth session of the Council of Trent, stamped what the Calvinist school would call Semi-Pelagianism as the orthodox doctrine. The reformed churches agreed with the Lutheran on the point of original sin. In this they followed Calvin rather than Zwingli, who considered it as an evil or disease, and as becoming sin only when a commandment is transgressed. The Arminians and Socinians, on the other hand, denied the doctrine of hereditary sin in the ecclesiastical sense. The Mennonites spoke of a loss of the Divine image in consequence of the fall of Adam, but still asserted the free-will of man. The Quakers rejected the name of original sin altogether; they held that there is a germ of sin in man, from which imputable sin springs, and that, however corrupt, he has still the susceptibility of being awakened to the inward light. The whole Prot. Church held, besides, that the Lord Jesus alone was free from sin, both original and actual. The Rom. Cath. Church ascribed this attribute also to the Virgin Mary, though no public and distinct declaration on the point was given by the Council of Trent: see IMMACULATE CONCEPTION.

The harshness of the Augustinian dogma led, at the time of the Reformation, to keen controversies: Erasmus disputed the point with Luther, and would admit only a weakness of the free-will arising from original sin, and by no means a complete annihilation of free-will. From that time the doctrine in Germany continued to be variously attacked and defended. It has been discussed by the schools of philosophy. Kant showed the moral signification of the dogma, and made out original sin to be a propensity to evil inherent in man. The Schelling-Hegel school explained it as the finite nature with which the individual is born. In recent times, the theologians of the old Lutheran and strictly orthodox tendencies, such as Olshausen, Tholuck, Hengstenberg, and others, have come forward as adherents and defenders of the Augustinian doctrine; while the more liberal theologians modify it in various ways, not admitting any moral inborn corruption arising from the fall, but only a weakness in man's nature for the knowledge and performance of good.

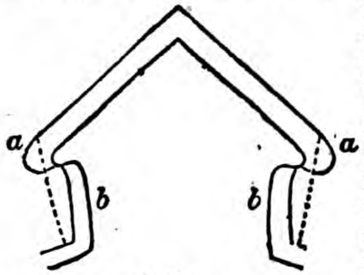
How far, and with what differences, the extreme Augustinian view is held by the churches of England and Scotland is shown respectively by the following extracts from the *Thirty-nine Articles* and the *Westminster Confession of Faith.* From Art. ix. of the *Thirty-nine Articles:* 'Original sin standeth not in the following of Adam (as the Pelagians do vainly talk); but it is the fault and corruption of the nature of every man, that naturally is engendered of the offspring of Adam, *whereby man is very far gone from original righteousness*, and is of his own nature inclined to evil, so that the flesh lusteth always contrary to the spirit; and therefore, in every person born into the world, it deserveth God's wrath and damnation.'

From chap. vi. of the *Westminster Confession:* 'By this sin' (i.e., the eating of the forbidden fruit), 'they' (i.e., our first parents) 'fell from their original righteousness and communion with God, and so *became dead in sin, and wholly defiled in all the faculties and parts of soul and body.* They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation. From this original corruption, *whereby we are utterly indisposed, disabled, and made opposite to all good, and wholly inclined to all evil,* do proceed all actual transgressions.'

In much of the recent development of evangelical thought, the term original sin is not favored. The fact which it was intended to set forth is not denied; indeed, such denial is not possible in view of the realities of human history and human life; but the fact is held as scarcely amenable to a strictly philosophic statement which shall be accurate and exhaustive. The tendency is to leave it as part of the solemn background of mystery which is sure to assert itself under any clear scriptural presentation of God's sanctifying and saving grace in Christ.

ORIHUELA, *ō-rē-wâ'lâ:* ancient town of Spain, in the modern province of Alicante, 36 m. s.w. of the city of Alicante; on the banks of the Segura, in a plain remarkable for beauty and fertility. The town is long and straggling; and its palm-trees, square towers, and domes give it an oriental appearance. It contains a cathedral, numerous churches and convents, barracks, etc. The manufactures are linen goods and hats, and there are many corn and oil mills and tanneries. Olive-oil is very extensively made. The vegetation here is gigantic; the oleanders are trees. O. has been possessed by Carthaginians, Romans, Moors, and Spaniards in turn. Pop. 24,000.

ORILLON, n. *ŏ-rĭl'ŭn* [F. *orillon*, a sort of fortification—from *oreille*, an ear—from L. *auris*, an ear]: in *fortification*, especially in the earlier systems, a semicircular projection at the shoulder of a bastion, intended to cover from the observation of the enemy the guns and defenders on the flank, which, with such a construction, is somewhat retired or thrown back. The flank thus protected is held by many distinguished engineers to be most valuable in the defense of the ditch, in clearing it from an attacking party, or from hostile miners. The retired flank is sometimes straight; at others curved, as in the figure. The O. is as old as the bastion, and is found in the works of Pagan and Speckle.



Orillon:
a, *a*, orillons; *b*, *b*, retired flanks (the dotted lines show the original bastion).

ORINOCO, *ō-rĭ-nō'kō:* great river of S. America, flowing through Guiana and Venezuela, and reaching the Atlantic Ocean s. of Trinidad, lat. 8° 40′ n. The country in which it takes its rise is inhabited by an aboriginal race called the Guaicas, who have hitherto prevented access by foreigners to its sources; but it is known to rise in the Sierra Parime, one of the chief mountain chains of Guiana, near lat. 3° 40′ n., long. 64° 30′ w. It was explored by Humboldt to the village of Esmeraldas (lat. 3° 8′ n., long. 66° 5′ w.), and by Schomburgk to within 30 m. of its source. After flowing w.s.w. 20 m., past Esmeraldas, the river bifurcates, and the s. branch, the Cassiquiare (q.v.), flowing s.w., joins the Rio Negro, an affluent of the Amazon. From this point the O. flows n.w. to its junction with the Guaviare, then n.e. to its junction with the Apure, after which it flows e. to its mouth. Length 1,960 m. The head of uninterrupted navigation is at the confluence of the O. with the Apure, 777 m. from the mouth of the river. Above this point, the course is interrupted by 'raudals' or cataracts, of which those of Maypures and Atures are the most celebrated. Its principal affluents from the left are the

Guaviare, the Viehada, the Meta, and the Apure; from the right, the Ventuare, Caura, and Caroni. The O., which is joined by 436 rivers and more than 2,000 smaller streams, drains an area (usually stated at 250,000 sq. m.) which, according to Wappäu's *Republiken von Süd-Amerika*, may be estimated at 650,000 sq. m. It begins to form its delta 130 m. from its mouth, by throwing off a branch which flows n. into the Atlantic. Several of the mouths are navigable, and the main stream, the Boca de Navios, is divided by a line of islands into two channels, each two m. in width. Bolivar, a town more than 250 m. from the mouth of the river, marks the head of tide-water, and here the river is 4 m. wide and 390 ft. deep. Below the junction of the Apure, the character of the scenery seems to be uniform—forests on the right bank, and llanos on the left.

ORIOLE, n. *ō'ri-ōl* [Sp. *oriol*—from L. *aurĕŏlus*, golden (see ORIEL): OF. *oriol*, a witwal], (*Oriolus*): genus of birds of the Thrush family (*Merulidæ* or *Turdidæ*), having an elongated conical beak, broad at the base; the upper mandible ridged above, and notched at the point; wings of moderate size, the first feather very short, the third the longest; the tail of moderate length, and rounded; the tarsus not longer than the middle toe; the outer toe joined at its base to the middle toe; claws strong and curved. The species are numerous, all natives of the old world, and chiefly of the warmer parts of it; the adult males generally of much brighter plumage than the females and young males, the prevalent color yellow. Only one species is found in Europe, the GOLDEN O. (*O. galbula*), common in Italy and some other parts of Europe, but a rare summer visitant of England. The name O. is still very frequently given to the Baltimore-Bird (q.v.) and other American birds of the Starling family, the chief resemblance of which to the true orioles is in color.

ORION, n. *ō-rī'ŏn* [L. and Gr. *Orion*; It. *Orione*; Fr. *Orion*]: in Greek mythology, a gigantic hunter, reputed the handsomest man in the world. His parentage is differently given. According to the commonly received myth, he was the only son of Hyrieus of Hyria, in Bœotia, and was called in his own country Kandaon. Another account makes him a son of Poseidon and Euryale, while some state that he was *Autochthonos*, or 'earth-born.' So immense was his size, that when he waded through the deepest seas he was still a head and shoulders above the water; and when he walked on dry land, his stature reached the clouds. Coming to Chios, in the Ægean Sea, he fell in love with Æro or Merope, daughter of Œnopion. He cleared the isle of wild beasts, and brought their skins as presents to his sweetheart; but her father always put off their marriage; whereupon O., one day giving way to passion (under the influence of wine), sought to take the maiden by force. Œnopion now called upon Dionysus (Bacchus) for help, who put out the eyes of the inebriate lover. O., however, recovered his sight in Lemnos, by following the advice of an oracle, and returned to Chios to take vengeance on Œnopion. Not finding him, he went to Crete, where he spent the rest of his life hunting in company with Artemis (Diana). The cause and manner of his death are differently related. Artemis, say some, slew him with an arrow, because Eos, inflamed by his beauty, had carried him off to Ortygia, and thereby offended the gods. Others aver that Artemis, virgin-goddess though she was, cherished an affection for him, that made her brother Apollo fiercely indignant. One day, pointing out to her at sea a black object floating in the water, he told her that he did not believe she could hit it. Artemis, not recognizing her favorite, drew her bow, and pierced him through the head. A third myth makes him find his death from the sting of a scorpion. Asklepios (Æsculapius) wished to restore him to life, but was slain by a bolt of Zeus. After his death, O. was placed with his hound among the stars, where, to this day, the most splendid constellation in the heavens bears his name: it is represented by the figure of a man with a sword or club by his side, and covered with a lion's skin.

ORIONID, n. *ō-rī′o-nĭd* [Eng. *Orion*]: in *astron.*, a meteoric ring having its radiant point in Orion. The orbit of the earth intersects it in October.

ORISON, n. *ŏr′ĭ-zŏn* [OF. *orison;* F. *oraison*, a speech, a prayer—from mid. L. *oratĭōnem*, a prayer—from L. *oro*, I speak or plead]; a prayer or supplication.

ORISSA, *ō-rĭs'sâ:* ancient kingdom of Hindustan, the authentic history of which goes back to A.D. 473. It extended from Bengal—a part of which it included—on the n. to the banks of the Godavari on the s., and from the coast on the e. to the river Gondwana on the w. From its remains of sculptures, inscriptions, etc., we may infer that its early civilization was high. The temple of the sun at Kanárek—erected about the 12th c.—exhibits carvings representing the planets, sculptured figures of animals, etc., which show that at that date the plastic and mechanical arts were in a more advanced state in O. than they were in England. It maintained its position as an independent monarchy till 1558, when, its royal line having become extinct, it became an outlying province of the empire of the Great Mogul. On the breaking up of this empire, the more valuable portions of O. were seized by the Nizam of Hyderabad. The French, who had taken possession of a part of the country long known as the Northern Circars, attempted to drive out of India the English, who also had formed commercial settlements on the coast. The result of the contest for supremacy in India, between the French and English, is well known. The Mahrattas, who had seized a portion of O. 1740, were forced to surrender it to the English 1803. The soldiers of the E. India Company were marched into O. at the commencement of the 19th c., and an engagement was subsequently entered into between the company and the native chiefs and princes, by which the former bound themselves to perform certain services for the country (as maintaining the river-banks in good repair), while the latter engaged to pay a yearly tribute. Of the many principalities into which O. was divided, a large number got into arrears with the govt., and the result was that numbers of the estates were sold, and the govt. frequently became the purchaser. Much of the territory originally forming a portion of this kingdom thus fell into the hands of the British. The ancient O., which existed as an independent monarchy for four centuries, and flourished as a principality of the Mogul empire after 1558, is now hardly to be recognized in the British commissionership of O., with area 23,901 sq. m. O. is traversed by a branch of the eastern Ghauts running parallel with the coast. The hill districts, which nowhere present an elevation of more than 3,000 ft., are inhabited by the Gonds, the Koles, the Sourahs, and the Khonds. The Khonds occupied an area extending from n. of the Mahanadi, s. to the banks of the Godavari. Their mountain-haunts are admirably suited for defense, as the districts which they inhabit are almost inaccessible; and though they do not yet appear to have adopted firearms, they manage their battle-axes and bows and arrows with an adroitness and courage that make them formidable enemies. The Khonds are a totally distinct race from the inhabitants of the plains, and there is but little resemblance between them and the other hill tribes, the Gonds and Sourahs. The chief peculiarities of the Khonds are, that their language, quite distinct from those of the neighboring tribes, is not in the least understood by the inhabitants of the plains; and that human sacrifice formed, till within the last few years, one of the distinguishing features of their religion. They do not barter or traffic, and all commercial transactions are managed for the Khonds by the Panus, Doms, etc., regarded by their employers as inferior races. There are, however, no caste prejudices among the Khonds, such as prevail throughout the plains of India. Agriculture and war are the only employments. The revolting custom of human sacrifice prevailed among the Khonds from the earliest times, although it was not till 1836 that the attention of the govt. was specially called to the subject, at the conclusion of an insurrection, in the course of which British officers had been brought into contact with the hill tribes. The Khond victims, called Meriah, were always bought with a price, sometimes from families of their own tribes who had fallen into poverty, but generally kidnapped from the plains by miscreants of the Panu race. The Meriah victims were of both sexes, and of every age; though adults were held in highest esteem, because, being the most costly, they were supposed to be more acceptable to the deity. The object of the sacrifice was to propitiate the earth-god; and abundant crops, security from calamity, and general prosperity were supposed to be insured to any one who had cut off a portion of the flesh of the human victim, and buried it in his farm. The consummation of the Meriah sacrifice was often with most revolting and disgusting cruelty. In some cases the event was preceded by a month's feasting, intoxication, and dancing round the Meriah. On the day before the sacrifice, the priest thus addressed the victim: 'We have bought you with a price, and did not seize you; now we sacrifice you according to custom, and no sin rests with us.' On the following day, the victim was made senseless from intoxication, and then suffocated; after which the officiating priest cut a portion of the flesh from the body, and buried it as an offering to the earth-god. The people, following his example, hewed the flesh from the bones, and carried the bloody trophy to their distant villages, where it was buried. In many cases the victim was not intoxicated before sacrifice; but the joints of his arms and legs were broken with a hatchet, in order to prevent the possibility of resistance. From 1837 the govt. put forth strenuous efforts to suppress this abhorrent practice, appointing as special agents for the purpose Maj. M'Pherson and Maj.Gen. Campbell; and 1852–3 all victims retained for sacrifice were demanded. The custom has entirely ceased. The practice of female infanticide also has now been almost suppressed. The irrigation of a large portion of O. is provided for by an extensive and costly system of canals, taken by the govt. 1868. Careful surveys of its coast were made 1870.—The country was decimated by famine 1868–9. Pop. (1872) 4,317,999.

See *Report by Lieut. M‘Pherson*, 1841; *An Account of the Religion of the Khonds in Orissa, idem* in the *Trans. of Asiat. Societies*, 1851; Campbell's *Personal Narrative of Service amongst the Wild Tribes of Khondistan*, 1864; *Calcutta Review*, Nos. IX., XI., XV., and XX.; Kaye's *History of the Administration of the E. I. Coy.*, 1853; *Memoir: Administration of India during Last Thirty Years*, 1858; *Indian Records—History of the Rise and Progress of the Operations for the Suppression of Human Sacrifice and Female Infanticide in the Hill Tracts of Orissa* (1854); and *Orissa*, by W. W. Hunter, director-gen. of the statistical survey of India (1872).

ORISTANO, *ō-rĭs-tâ'nō:* town, and inferior river-port on the w. coast of Sardinia, 56 m. n.w. of Cagliari. It stands in a fruitful, well-cultivated plain, about a mile from the left bank of the Tirso or Oristano, and 3 m. from its mouth in the Gulf of O., which is about 10 m. in length, with a breadth of 5 m. It is surrounded by ancient walls flanked with towers; contains a cathedral with a great clock-tower, the most conspicuous object in the town; an archbishop's palace, college, and several churches and convents. O. has manufactures and fisheries. In summer the town is unhealthful. Pop. 2,500.

ORIZABA, *ō-rē-sâ'ba*, Sp. *ō-rē-thâ'râ:* town of Mexico, state of Vera Cruz, 70 m. w.s.w. of the town of Vera Cruz, 25 m. s. of the volcano of Orizaba. The vicinity is unusually fertile, and is covered with forests. The town contains numerous churches, a high school, and an extensive cotton-spinning factory. Coarse cloths and tobacco are largely manufactured, and there is much general industry. Pop. 15,000.

ORIZABA, *ō-rē-sâ'ba*, Sp. *ō-rē-thâ'râ*, AND POPOCATÉPETL, *pō-pō-kât-ā-pā'tl:* two highest mts. of Mexico. Hitherto Popocatepetl has been deemed the higher peak, and the highest mountain of N. America, except Mt. St. Elias, Alaska; but certain precise barometric determinations in the spring of 1890 by Prof. Heilprin of the Philadelphia Acad. of Nat. Sciences, necessitate revision of the recorded heights of these mountain masses.

The height of Orizaba as determined by Humboldt, by means of angles taken from the town of Jalapa, was 17,375 ft. An earlier determination, by Ferrer, made it 17,879, but Humboldt's has been generally accepted. Prof. Heilprin's measurement, made about 120 ft. below the apex of the cone (for the ascent had been exceedingly difficult, and he was unable to reach the highest point), indicates a total height of 18,206 ft. The ascent of Orizaba was made Apr. 6–7; that of Popocatepetl 10 days afterward. Prof. Heilprin's party reached the highest point of the latter mountain Apr. 17, and found the height 17,523 ft.—about 200 ft. less than Humboldt's measurement, and 683 ft. less than his own measurement of Orizaba. Two other great Mexican summits also were ascended—Ixtaccihuatl, found to be 16,962 ft. in height, and Monte Nevado de Toluca, 14,952 ft.

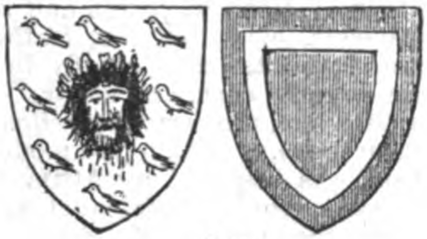
ORKNEY ISLANDS, *awrk'nē:* with Shetland, forming one county, separated from Caithness by the Pentland Firth (q.v.); between 58° 41′ 24″ and 59° 23′ 2″ n. lat., and between 2° 22′ 2″ and 3° 25′ 10″ w. long. They are 73 in number at low water, of which 28, besides Pomona, known as the Mainland, are inhabited. The area of the O. I. is 610 sq. m., or 390,147 imperial acres. Pop. (1871) 31,274; (1881) 32,037. The surface is very irregular, and the land is indented by numerous arms of the sea. The highest hill is the Ward of Hoy, 1,555 ft. The rocks are of the old red sandstone formation, except a small granitic district near Stromness. Previous to the middle of the 18th c., the agriculture of Orkney was primitive. There was little communication with the mainland. The spinning-wheel was not introduced there for half a century after it was in use elsewhere. The people used to suffer periodically from bad seasons and violent storms. In 1778 a great hurricane drove the sea-spray over the islands, nearly ruining the grain crop; and it was necessary to import food to the value of £15,000, or nearly twice the gross rental of the county. Orkney now contains 22 parishes, forming 3 presbyteries and 1 synod. There are also about 30 congregations belonging to the Free and United Presbyterian churches, besides 3 Congl., and one or two others.

The temperature of Orkney is comparatively mild, considering its northern latitude. This is due chiefly to the neighborhood of the Gulf Stream to its western shores. For the 13 years ending 1869, the mean annual temperature was 46°; the mean temperature of Jan. and Feb., the coldest months, 39°; and that of July, 55°. The annual rainfall varies from about 28 inches on the e. side of the isles to 37 inches on the west.

The carrying-trade and merchandise of Orkney have greatly increased of late years. The value of exports (1871) exceeded £250,000—chiefly of fish and cattle. The number of eggs exported 1880 was more than 11,000,000, of the value of more than £32,000. The total acreage 1881, under all kinds of crops, bare fallow, and grass, was 108,795. The number of horses in 1881 was 6,181; cattle, 26,103; sheep 29,064; swine 3,769. The number of occupants of land was 3,147. The valued rent of the O. I. (1653) was £57,149 Scots, or £4,763 sterling. The valuation (exclusive of the burgh of Kirkwall) (1879–80) was £65,061. The chief towns are Kirkwall (q.v.), the cap. (situated in Pomona), and Stromness, in which there are 3 distilleries, producing more than 20,000 gallons of whisky annually.

The Orkneys, under the name *Orcades* [whence the modern adjective, Orcadian], are mentioned by the ancient geographers, Pliny, Ptolemy, Mela, and by other classical writers; but of their inhabitants we know almost nothing till the dawn of the middle ages. They were probably of the same stock as the British Celts. From an early period, however, the Norsemen resorted to these islands, as a convenient spot from which to make a descent on the Scotch and English coasts. In 876, Harald Haarfager conquered both them and the Hebrides. During the greater part of the 10th c., they were ruled by independent Scandinavian jarls (earls), but in 1098 they became formally subject to the Norwegian crown. Thus they remained till 1468, when they were given to James III. of Scotland as a security for the dowry of his wife, Margaret of Denmark. The islands were never redeemed from this pledge; and in 1590, on the marriage of James I. with the Danish Princess Anne, Denmark formally resigned all pretensions to the sovereignty of the Orkneys. During their long connection, however, with Norway and Denmark, all traces of the primitive population disappeared. The present proprietors of land are chiefly of Scotch descent; and the inhabitants generally are a mixed race of Scandinavian and Scotch descent.

ORLE, n. *ŏrl* [F. *orle* or *ourlet*, a hem, a margin—from mid. L. *or′ula*, dim. of *ora*, an edge]: in *her.*, figure in the form of a fillet or border round a heraldic shield, but at a distance from the edges. It is one of the charges known under the name of sub-ordinaries; said to be the diminutive of a Bordure (q.v.), but differing from it in being detached from the sides of the shield. It may be the sole charge in a shield. An orle of heraldic charges of any kind denotes a certain number (generally eight) of these charges placed in orle. ORLE, or OR′LET, *-lĕt*, or OR′LO, n. *-lō*, in *arch.*, fillet under the ovolo of a capital.



Orle.

ORLEANS, n. *ŏr′lēnz* [*Orleans*, in France]: common variety of plum.

ORLEANS, *or-lā-ŏng':* important commercial town of France, cap. of the dept. of Loiret, and formerly cap. of the old province of Orleannais, which now forms the greater part of the depts. of Loiret, Eure-et-Loir, and Loir-et-Cher; on the right bank of the Loire, here crossed by a bridge of 9 arches; 75½ m. s.s.w. of Paris by railway. Pop. (1880) 57,314. Close to the city is the Forest of O., one of the largest in the country, 94,000 acres, planted with oak and other valuable trees. O. stands on the verge of a magnificent plain sloping toward the Loire, and watered by the Loire and Loiret; and is surrounded on the land-side by a wall and dry ditches, on either side of which are pleasantly shaded boulevards. Around it are eight prosperous and populous suburbs. Among its principal buildings are the cathedral, with two lofty and elegant towers, one of the finest Gothic edifices in France; the tower; bishop's residence; the houses of Joan of Arc, of Agnes Sorel, of Diane de Poitiers, of François I., of Pothier; the numerous churches and hospitals; the *musée*, theatre, etc. The town contains three statues of Joan of Arc, of which the equestrian one was unveiled 1855. The situation of O. has many commercial advantages, from its position on a navigable river, on lines of railway which connect it with Paris and the great trading towns in s. France, and on the canal which connects the Loire with the Seine. Hosiery, cotton and linen goods, refined sugar, vinegar, bleached wax, leather, etc., are manufactured; and the trade is chiefly in stockings, sheepskins, wine, brandy, corn, and sugar.

O., originally *Genabum*, afterward *Aureliani* (probably from Emperor Aurelian), of which the modern name is only a corruption, was besieged by Attila 451, but relieved by the Romans, who here defeated Attila. It afterward passed into the hands of the Franks, was taken by the Northmen 855, and again 865. In 1428 it was besieged by the English under the Duke of Bedford, but was delivered by Joan of Arc (q.v.), therefore named the Maid of O. In the wars of the 16th c., O. suffered severely. It was taken by the Germans 1870, and was their centre of operations against the French army of the Loire.

ORLEANS', House of: see Bourbon.

OR'LEANS Island: in the St. Lawrence river, in the province of Quebec, Can., about 4 m. from the city of Quebec. It is 20 m. long, and 6 m. across at its widest part; about 70 sq. m. The soil is fertile, and there is an abundance of timber. Agriculture is the principal industry. Pop. about 5,000.

ORLEANS′, Jean Baptiste Gaston, Duc d': 1608, Apr. 25—1660, Feb. 2; b. Fontainebleau; third son of Henry IV. of France and Marie de' Medici. He possessed fair abilities, but his education was neglected. On his marriage with Marie of Bourbon, Duchess of Montpensier, 1626, he received the duchy of Orleans as appanage. His wife soon died, leaving one daughter, the celebrated Mademoiselle de Montpensier. His brother, Louis XIII., regarded him with dislike as heir-presumptive to the throne, the queen having no children; and his treatment at the hands of the king and of Richelieu led him to join with his mother in attempting the overthrow of that minister. He left the court with a number of other great nobles, 1631, Feb.; sought the support of the Duke of Lorraine, whose sister he married; and raised in the Spanish Netherlands a corps of 2,000 men, at the head of which he crossed the French frontier, assuming the title lieut.gen. of the kingdom; but was completely defeated by Marshal Schomberg at Castelnaudary, and fled to the Duke of Lorraine, whom he thereby involved in ruin. In 1634, however, he returned to the French court. Richelieu sought to have his marriage with Marguerite of Lorraine declared invalid; but after a long struggle, and much disputing among jurists and theologians, its validity was sustained. The duke was, however, compelled to leave France again in consequence of fresh intrigues against Richelieu. After Richelieu's death, a reconciliation was effected between him and his brother, the king, by the ministers Mazarin and Chavigny; and Louis XIII. appointed him lieut.gen. of the kingdom during the minority of Louis XIV. Mazarin and the queen-mother, Anne of Austria, attempting to assume all power to themselves, the duke placed himself at the head of the Fronde (q.v.); but, with his usual vacillating weakness and selfish sacrifice of his friends, soon made terms again with the court. Yet, when Mazarin returned from banishment 1652, the duke again assembled troops for the Prince of Condé, on which account, after the disturbances were ended, he was confined to his castle of Blois, where he died. He left three daughters by his second marriage.

ORLEANS′, Louis Philippe Joseph, Duc d': 1747, Apr. 13—1793, Nov. 6; great-grandson of the regent Philippe, Duc d'Orleans. He possessed very good abilities; but early fell into gross debaucheries, in which he continued to the end of his career. Louis XVI. disliked him for his debased character, and the queen for his obtrusiveness. He became gradually estranged from the court, sought popularity and obtained it, and embraced the cause of American independence. In the assembly of notables 1787, he declared against the ministerial proposals; and when the king sought to overcome the resistance of the parliament by a *lit de justice*, he protested against the proceeding. On the assembly of the states-general, he took the popular side, and voted with the extreme Left in the national assembly; seeking at the same time to please the populace by profuse expenditure, with the hope of being made lieut.gen. of the kingdom, or perhaps of opening for himself a way to the throne. When the insurrectionary movements began in Paris 1789, he promoted them by secret agents and money. The court sent him on an ostensibly diplomatic mission to England, from which he returned 1790, July, after more than six months' absence, and unscrupulously engaged in new intrigues hostile to the king. But he began to find that he himself was made the mere tool of a party, who availed themselves of his influence and wealth for their own purposes; and this discovery cooled his revolutionary fervor. He withdrew from the Jacobin Club, was reconciled to the king, and appeared at court; but was treated with such disrespect by the courtiers, that he turned away, and from that time followed in blind rage the stream of the revolution. He joined Danton's party, was concerned in insurrections, disclaimed all pretensions to the throne, renounced his titles, assumed the name Philippe Égalité, was addressed as Citizen Égalité, and was returned by the dept. Seine-et-Marne to the national convention, in which he took his place among the Mountain party. He voted for the death of the king, being, it is said, himself threatened with death by the Jacobins if he should do otherwise, but alleging his sense of duty and his belief that every one who did anything contrary to the sovereignty of the people deserved death. The vote was received with a cry of disgust, and by no means increased the safety of his own position. The Mountain party were dissatisfied with him, because he did not give up the whole of his immense wealth for party purposes. After the desertion of his son, the Duke de Chartres (see LOUIS PHILIPPE), the decree for the imprisonment of all the Bourbons was applied to him. He was thrown into prison with his family in Marseille, and was brought before the tribunal of the dept. of Bouches-du-Rhône on a charge of high treason He was acquitted, but the committee of public safety immediately brought him before the revolutionary tribunal in Paris; and 1793, Nov. 6, he was condemned, and the sentence was executed the same day, amid the execrations of the multitude which had so often applauded him.

OR′LEANS, MAID OF: see JOAN OF ARC.

ORLEANS′, PHILIPPE, DUC D', Regent of France during the minority of Louis XV.: 1674, Aug. 4—1723, Dec. 2; son of Philippe, Duc d'Orleans, and grandson of Louis XIII. He possessed excellent talents, and made unusual attainments in science and belles-lettres; but his tutor, Cardinal Dubois (q.v.), did not scruple to minister to the strong passions of the young prince, and exercised a most pernicious influence over him. He gave himself up to debauchery. The king compelled him to marry Mademoiselle de Blois, the king's daughter by Madame de Montespan. He astonished and alarmed the court by protesting against his exclusion, by the testament of

Charles II., from all right of succession to the throne of Spain, and by the attention which he immediately began to give to military and political affairs. His military talents, however, led to his employment in the wars in Italy and in Spain; but his presence in Madrid after his victories was regarded with apprehension both by Philip V. and by Louis XIV. He had, indeed, formed the design of taking possession of the Spanish throne for himself. In consequence of this, he lived for some years in complete exile from the court, and much dreaded by it; spending his time both in vicious excesses and in the cultivation of the fine arts and the study of chemistry. This study afforded a pretext to Madame de Maintenon and her party for accusing him of poisoning the dauphin and others of the royal family, who died suddenly, and in rapid succession, of malignant fever, 1711. The king refused an investigation which the duke demanded. Louis, having legitimized his sons, the Duke of Maine and the Count of Toulouse, appointed the Duke of Orleans only pres. of the regency and not regent, giving the guardianship of his youthful heir and the command of the household troops to the Duke of Maine; but all this was set aside at the king's death, and the Duke of Orleans became sole regent. He was popular, and his first measures increased his popularity; but the financial affairs of the kingdom were perplexing, and the regent's adoption of the schemes of Law (q.v.) led to disastrous results. Meanwhile, 1718, Aug. 26, he held the famous *lit de justice*, in which he prohibited the parliament of Paris from meddling with financial or political affairs, and declared the legitimized sons of Louis XIV. incapable of succeeding to the throne. Dubois, who still possessed an unhappy influence over his former pupil, became prime minister, and eventually ruler of France; the regent, who was really a man of far higher abilities, neglecting all duties, and pursuing a course of profligacy almost unequalled in the worst instances of antiquity. His eldest daughter, the Duchess de Berry, followed his example, and brought herself to an early grave. Dubois, wishing to be made a cardinal, persuaded the regent to sacrifice the Jansenists, and to compel the parliament 1722 to recognize the bull *Unigenitus* (q.v.). After the king's coronation, 1723, Feb. 15, and the death of Dubois in Aug., the Duke of Orleans, though disliking public affairs, consented to become prime minister; but died Dec. 2 of the same year, physically exhausted by incessant debauchery. The influence of his religious and other opinions, and the example of his immoralities, powerfully tended to promote that state of things which eventually produced the horrors of the French Revolution.

ORLEANS CLOTH, *awr'lē-anz:* material for ladies' dresses, in which the warp is of cotton and the weft of worsted; so called from having been made first at Orleans in France; but it is now extensively manufactured at Bradford in Yorkshire, England.

ORLOFF, or Orlov, *or-lof':* Russian family that rose to eminence during the reign of Paul III., when one of its members, Count Gregori O., attracted the notice of the Grand Duchess Catharine, afterward Empress Catharine II., and succeeded Poniatowski as her favorite. It was Gregori who planned the murder of Peter III., and his brother Alexei who committed the deed; and both received high honors and rich rewards for this and other services. The flourishing family of the Counts Bobrinski resulted from Gregori's intercourse with the empress. The legitimate line of O. soon became extinct; but Feodor, brother of Gregori and Alexei, left four illegitimate sons, one of whom, Mikail, distinguished himself in the campaign of 1814; and another was Count Alexei O., the celebrated diplomatist. Count Alexei O. (1787–1861, May 20) signalized himself by courage and military talents during the French wars, negotiated the treaties of Adrianople (1829) and Unkiar-Skelessi (1833), and represented Russia at the London conference 1832 on the affairs of Belgium and Holland. In 1844 he was placed at the head of the secret police; and the ability and energy with which he directed its vast machinery rendered him the most dreaded official in Russia. He was high in the favor of Emperor Nicholas, who employed him in the negotiations with Austria previous to the Crimean war. In 1856 he sat in the congress of Paris as the representative of Russia, and on his return was made pres. of the grand council of the empire. He died at St. Petersburg.

ORLOP, n. *ŏr'lŏp* [Ger. *überlauf*, the deck of a ship—from *überlaufen*, to run over the whole surface: Dut. *overloop*—from *over*, over; *loopen*, to run]: in a *ship*, the lowest deck, immediately above the hold. On it are stowed the cables, sails, etc. In ships of war it contains the magazine, bread-room, and various store-rooms; and is used in time of action for reception and treatment of the wounded, as, being below the water-line, it is the safest part of the ship.

ORME'S HEAD, *awrmz hĕd*, Great: headland in the n.e. of Caernarvonshire, n. Wales, five m. n.n.w. of Conway; lat 53° 20' n., long. 3° 51' w. It is an enormous mass of limestone rock, surmounted by a light-house, and forming the extreme point of the w. shore of Orme's Bay.—Little Orme's Head forms the e. extremity of the same bay.

ORMOLU, n. *ŏr'mŏ-lô'* [Fr. *or*, gold; *moulu*, ground, bruised: L. *aurum*, gold; *molĕre*, to grind]: gilt bronze; gold-colored brass, or mosaic gold. It is a variety of brass, consisting of zinc 25 parts and copper 75 parts, which has a nearer resemblance in color to gold than ordinary Brass (q.v.). It is much used for castings of ornaments for furniture, candelabras, etc. When the casting is made, its color is brought out by a *pickle* of dilute sulphuric acid, after which the acid is removed by water, and a liquor varnish is put on to keep it from tarnishing. **Ormolu varnish**, a copper, bronze, or imitation gold varnish.

ORMONDE, *awr'mond*, JAMES BUTLER, **Duke of:** 1610 (about Oct. 19)—1688, July 21; b. London; first of the ancient Anglo-Irish family of Butler on whom the ducal title was conferred. The family was of illustrious antiquity. Genealogical legend carried it back to the dukes of Normandy before the Conquest, and it is certain that at the dawn of the 13th c. it held the hereditary office of royal cup-bearer or *butler*, whence the family name.—His father, son of the celebrated Walter, Earl of O., was drowned in crossing the Channel; and the old earl having incurred the displeasure of King James I., and being thrown into prison, James Butler, who on his father's death became, as Viscount Thurles, the heir of the title, was seized as a royal ward, and placed under the guardianship of the Abp. of Canterbury. On the restoration of his grandfather to liberty, he also was released; and in his 20th year he married his cousin, Lady Elizabeth Preston, and 1632 succeeded, on his grandfather's death, to the earldom and estates of O. During the Strafford administration in Ireland, O. distinguished himself so much, that on Strafford's recall he recommended O. to the king; and in the rebellion of 1640, O. was appointed to the chief command of the army. During the troubled times which followed, he conducted himself with undoubted ability, though, as a necessary consequence of the numberless divisions and subdivisions of party which then prevailed in Ireland, he failed to satisfy any one of the conflicting sections; and when, 1643, he concluded an armistice, his policy was loudly condemned as well by the friends as by the enemies of the royalist party in England. During the long contest of Charles with the parliament, O. continued to uphold the royal interest in his Irish govt.; and when the last crisis of the king's fortunes came, he resigned his Irish command, and retired to France, whence he returned to Ireland with the almost desperate design of restoring the royal authority, but, after a gallant but unequal struggle, was compelled, in 1650, to retire once more to France. His services to the royal cause continued unremitting during his exile; and at the Restoration he accompanied Charles II. on his return, and was rewarded for his fidelity by the ducal title of Ormonde. His after-life was less eventful, though he twice again returned to the government of Ireland. In 1679 the well-known attempt on the life of Ormonde was made by the notorious Col. Blood (q.v.). O., returning from a civic festival, was attacked by Blood and a party of ruffians, and was dragged from his coach with the intention of his being hanged at Tyburn. The attempt drew additional interest from its being commonly supposed to have been instigated by the profligate Duke of Buckingham, O.'s inveterate foe. The duke escaped uninjured. His letters and other papers are of deep historical interest. See Carte's *Life of Ormonde.*

ORMSKIRK, *awrmz'kėrk:* market-town of England, in Lancashire, in the centre of a rich and populous agricultural district, 12 m. n. of Liverpool by the Lancashire and Yorkshire railway. The parish church has both a tower and spire. Silk-weaving, rope-making, basket-making, and brewing are principal industries. There are large collieries in the vicinity. Pop. (1871) 6,127; (1881) 6,651.

ORMUZ, *awr'mŭz*, or HORMUZ, *hawr-môz':* small island in the Strait of O., at the entrance of the Persian Gulf, within ten m. of the Persian coast; about 12 m. in circumference. It belonged to the imaum of Muscat till 1854; in the 16th c. it was taken by the Portuguese, and being made by them an entrepôt for goods from India, Persia, and Turkistan, it became important, and the *town* of O. rose in population until it had 40,000 inhabitants. The town was demolished, 1622, by Shah Abbás, assisted by the English, and its trade was removed to Gombroon (q.v.).

ORMUZD, *awr'mŭzd* or *awr'môzd* (or AHURMAZD, or AURAMAZDA, or HORMAZD, or ORMAZD); corrupted from Ahurô-Mazdaô, i.e., that Ahura (Vedic Asura) or 'Spiritual Being' who is called Mazdaô (i.e., Vedic Medhâs) = 'Creator of all things:' the supreme deity of the ancient Persians, and of their descendants, the Guebres and Parsees. It was at first emphatically employed in this sense by Zoroaster, or Zarathustra Spitama. O. is, according to Zoroaster's original doctrine, the creator of the earthly and spiritual life, the lord of the whole universe, in whose hands are all creatures. He is the light and the source of light, the wisdom and the intellect, and is in the possession of all good things, such as 'the good mind,' 'immortality,' 'wholesomeness,' 'the best truth,' 'abundance,' etc.; which gifts he bestows on the pure in thoughts, deeds, and words, while the wicked are punished by him according to their wickedness. ('Father of the pure creatures at the beginning, who hath created the way of the sun, of the stars, who causeth the moon to wax and to wane. . . . He holdeth the earth and the unsupported [heavenly bodies?], the waters, and the trees, and giveth swiftness to the wind and the clouds. . . . The creator of the good mind, the working good, hath made light as well as darkness, sleep and waking, the morning dawns, the noons, the nights,' etc. —*Yazna*, 43.) Sprung from Zarvan-Akarana (the boundless time), i.e., being from eternity, self-existing, neither born nor created, O. was conceived as uniting within himself—like man and everything else existing—the two primeval principles of good and evil, the Spento-mainyus—i.e., the white, holy spirit; and the Angrô-mainyus (corrupted into Ahriman) = the dark spirit. This Zoroastrian conception of the two sides of the divine being—itself one and indivisible—has, however, in the course of time, partly through misunderstandings and wilfully false interpretations, undergone important changes.

While the Zarvan-Akarana was transformed by the Magi —in opposition to the Zendiks—into the Supreme Being itself, the philosophical notion of a duality in O. became the theological dogma of god and devil, jealous of each other's power, bent on the destruction of each other's works, consequently in constant war with each other, they and their armies. Both are—according to this corrupted view of later times, by means of which the genuine view has been forgotten till our day—supreme rulers; both have their fixed number of councilors (sprung from an egg, *Plut. Isis and Osiris*), who are the actual governors of the whole universe, each in his special province; which councilors, however, are neither more nor less than certain abstract ideas of Zoroaster. One personal archangel alone is assumed by the latter, viz., Sraosha (Serosh, cf. Skr. Shruti), i.e., hearing, tradition. He is vested with very high powers, and stands between O. and man; he is the teacher of good religion; he shows the way to heaven, and pronounces judgment over human actions after death. He is the personification of the whole divine worship and its outward manifestations, the symbols, prayers, sacrifices, rites, etc., and the chief combatant of the influence of the Devas, who stand symbolically for the Brahmanic religion. O. is represented as sitting upon a throne of light, as a venerable man, or seated upon a bull, etc.—For further particulars about the seasons and the manner of his worship, as well as the general relations between his and the Brahmanic religion (both the result of a prehistoric conflict between the Iranians and those Arian brother-tribes who immigrated into Hindustan Proper), see PARSEES: PERSIA: ZOROASTER.

ORNAMENT, n. *ŏr'nă-mĕnt* [L. *ornamentum*, a decoration—from *orno*, I decorate: It. *ornamento:* F. *ornement*]: something that beautifies and adorns; embellishment; additional beauty: V. *ŏr-nă-mĕnt'*, to render more beautiful or attractive to the eye; to embellish. OR'NAMENTING, imp. OR'NAMENTED, pp. OR'NAMENT'AL, a. *-ăl*, serving to decorate or adorn. OR'NAMENT'ALLY, ad. *-lĭ*. OR'NAMENTA'TION, n. *-tā'shŭn*, decoration; embellishment (see below). OR'NAMEN'TOR, n. *-tėr*, a decorator; a finisher of articles.—SYN. of 'ornament, v.': to adorn; decorate; beautify; bedeck.

ORNAMENTA'TION, or DECORA'TION: in Architecture: something added to the simple constructive features, or to the form given to those features, for the purpose of making them beautiful or elegant. Thus, the Doric shaft, while answering the constructive purposes of a simple square or round pier, has fluting as its O.; and its capital, with its beautifully proportioned echinus and abacus, supports, as a plain slab would do, the weight of the entablature. The other classic orders illustrate this in a richer manner. Thus, the Corinthian column, with its fluted and elegant shaft, resting on an ornamented base, and crowned by an ornamented capital, takes the place of what might have been, had utility alone been consulted, a plain pier of rubble-work, with a rough stone to rest upon, and another on the top to receive the load.

In classic architecture, as in every good style, the same principle pervades all the ornamental features—viz., *that they are constructive features ornamented in a manner suitable to their use*, e.g., a column, being a member for support, should be of such a form as to denote this; the constructive use of a cornice being to protect the top of the wall, and to shield the front of it from the rain and sun, it should be made of such form as to do this, and also to *look* as if it did it—to express its purpose. In classic architecture, the cornice consists of several members, in which the constructive decoration is well seen; the mutules and modillions beautifully indicating in an ornamental manner their original use, while the leaf enrichments of the small moldings give life and animation to the building. In mediæval art the same principle prevails in much greater degree, and over a more complex system of construction. The shafts, with their elegant and purpose-like bases and caps, are arranged so that each supports a separate member of the vaulting. The arch moldings are divided to indicate the rings of their constructive formation. The buttresses, so elegant in outline, express the part which they serve in supporting the vaulting; the pinnacles, with their ornamental finials, are the decorated dead-weights which steady the buttresses. The foliage and smaller ornament also is beautifully and suitably applied, as the growth and vigor of the supporting capitals and corbels, and the running foliage of the string-courses, arch-moldings, etc., fully illustrate.

There are, no doubt, many styles of art to which these remarks scarcely apply, e.g., the Assyrian, Egyptian, and Hindu styles, in which we find many features applied in a manner meant to be ornamental, though actually contrary to their constructive use. In these styles (also in Greek architecture), human figures, bulls, and other animals are placed as columns to carry the weight of a superincumbent mass. This is evidently wrong in principle, except when the figure is placed in an attitude to indicate that it is supporting a weight, as the Greek Atlantes do; but in the former cases, religious notions seem to have overcome true artistic feeling. There are also many forms of O. used in all styles, the origin of which is obscure, and their advantage doubtful, e.g., the zigzag, chevron, billet, etc., so common in early mediæval art, and the scrolls of Ionic and Indian art, and the complications of the interlacing work of the North in the middle ages. Such things may be admissible in colored decoration, such as the confused patterns of Saracenic art and the shell-patterns of Indian art; but where ornamental *form* is wanted, unless the requirements of the construction are carefully followed as the guide to the O., all principle is lost, and the ornament runs wild.

This has frequently occurred in the history of art, markedly in the art of the Renaissance.

The material in use also must have an influence on the form and style of the ornament. Thus, stone-carving and metal-work evidently require different treatment. Fac-simile leaves might be formed in iron, but could not be so carved in stone. This constructive element should be carefully attended to in designing. All imitative art must be to some extent conventional. Natural objects, such as leaves, flowers, etc., cannot be copied literally; and in suiting the conventional treatment to the nature of the material used, lies the great skill of the artist.

ORNATE, a. *ŏr-nāt′* [L. *ornatus*, adorned, embellished: It. *ornare;* F. *orner*, to adorn]: splendidly adorned; decorated; beautiful. ORNATE′LY, ad. *-lĭ.* ORNATE′NESS, n. *-nĕs*, the state of being ornate.

ORNE, *awrn:* department of France formed out of the old provinces of Normandy and Perche, separated on the n. by the dept. of Calvados from the English Channel (La Manche); 2,350 sq. m., more than one-half cultivable land. A range of wooded hills, nowhere rising above 1,370 ft., extends across the s. of the dept. from e. to w. North of this range, the surface slopes toward the English Channel; s. of it, toward the Atlantic. The principal rivers are the O. (which gives name to the dept.), the Rille, the Sarthe, and Huisne. The climate is damp, though in general temperate, and the winters are severe. The soil is fertile, but agriculture is not advanced. The inhabitants consume one-third more grain than is grown on the land. There are several millions of apple and pear trees planted along the roads, etc., and cider is extensively made. Cattle, and horses of the purest Norman breed, are reared. Mining is an important industry; chief products are iron and copper; marble, granite, and other stones for building are quarried. The dept. is divided into four arrondissements—Alençon, Argentan, Domfront, and Mortagne; cap. Alençon. Pop. of dept. (1881) 376,126.

ORNITHICHNITE, n. *ŏr′nĭ-thĭk′nīt* [Gr. *ornis* or *ornītha*, a bird; *ichnos*, the mark of a foot, a trace]: in *geol.*, footmarks found in mineral strata, supposed to be those of birds.

ORNITHOCOPROS, n. *ŏr′nĭ-thō-kŏp′rŏs* [Gr. *ornis* or *ornītha*, a bird; *kopros*, dung]: in *geol.*, the droppings or dung of birds—sometimes applied to guano.

ORNITHOIDICHNITES, n. plu. *ŏr′nĭ-thoy-dĭk′nīts* [Gr. *ornis* or *ornītha*, a bird; *eidos*, resemblance; *ichnos*, a footstep]: in *geol.*, bird-like footprints—a term denoting resemblance merely, without affirming that they are really the footmarks of a bird.

ORNITHOLITES, n. plu. *ŏr-nĭth′ŏ-līts* [Gr. *ornis* or *ornītha*, a bird; *lithos*, a stone]: in *geol.*, the remains of birds occurring in a fossil state.

ORNITHOLOGY, n. *ŏr′nĭ-thŏl′ŏ-jĭ* [Gr. *ornis* or *ornītha*, a bird; *logos*, discourse]: that branch of natural history which treats of the form, structure, habits, and uses of birds. ORNITHOLOGICAL, a. *ŏr′nĭ-thō-lŏj′ĭ-kăl*, pertaining to ornithology. OR′NITHOLOG′ICALLY, ad. *-lĭ*. OR′NITHOL′OGIST, n. *-thŏl′ŏ-jĭst*; one versed in ornithology.—*Ornithology* was prosecuted to some extent, with other parts of nat. history, by Aristotle, Pliny, and others of the ancients; but only in modern times has it assumed the rank of a distinct branch of science. The first modern author to attempt a scientific classification of birds seems to have been Pierre Belon, noted also as an ichthyologist, whose *Historia Avium* was published about the middle of the 16th c. Some of his classes are very heterogeneous assemblages; but the first three, viz., Birds of Prey, Web-footed Birds, and *Grallæ*, are so natural as to have been acknowledged, with some modification of their limits, in all subsequent systems. In the 17th c. much progress was made in the observation and description of species, not only of the birds of Europe, but of other parts of the world. In the latter part of the century, attention began to be given to the anatomy of birds. An ornithological system, more perfect than that of Belon, was proposed by Willughby about 1676, and afterward matured and improved by Ray. On this system that of Linné was founded. During the 18th c., the progress of O. was very rapid. The birds of many countries were described in special works, and the habits of birds began to be carefully observed; but the system of Linné, as framed by him before the middle of the century, continued to prevail almost unmodified till the publication of Cuvier's *Règne Animal* 1817. Latham, Lacépède, Illiger, Temminck, and others, had indeed previously proposed systems more or less different from it; and systems have since been proposed by others, particularly by Vigors and Swainson, who have endeavored to accommodate the classification to certain first principles which they supposed to pervade nature, but which naturalists in general regard as fanciful. The system of Cuvier is now generally received by ornithologists, as that of Linné formerly was; not, however, without modifications, by which it has been sought to accommodate it to the progress of science; and some of the names introduced by other authors have obtained very general acceptance. The system of Linné divided birds into six orders—*Accipitres*, *Picæ*, *Anseres*, *Grallæ*, *Gallinæ*, and ***Passeres***. That of Cuvier also divided them into six orders—***Birds of Prey*** (the *Accipitres* of Linné, now often called ***Raptores***); *Passerine Birds* (*Passerinæ*, now generally called *Insessores*, or *Perching Birds*, including most of the Linnean *Passeres* and part of *Picæ*); *Climbers* (***Scansores***, part of the Linnean *Picæ*, and often designated ***Zygodactyli***, or *Zygodactylous Birds*); *Gallinaceous Birds* (now often called *Rasores*, the Linnean *Gallinæ*, but including also the pigeons or *Columbidæ*, which Linné placed among ***Passeres***); ***Stilt Birds***, often called ***Waders*** (***Grallatores***, the Linnean *Grallæ*); and *Web-footed Birds* (*Palmipedes*, now known also as *Natatores*, or *Swimmers*). For these orders, see separate titles. Perhaps the most important modification of Cuvier's system which has been proposed is the separation of the *Brevipennes* or *Struthious Birds* from *Grallæ*, and their formation into a distinct order, sometimes called *Cursores* or *Runners;* and next to this may be mentioned the proposed separation of *Columbidæ* from Gallinaceous Birds.—The progress of O. since the commencement of the 19th c. has been very rapid; every department of it has been assiduously cultivated, and many of the works published have been not only of great merit, but very sumptuous and beautiful. For Huxley's division of birds into three orders, see ZOOLOGY.

ORNITHOMANCY, n. *ŏr-nĭth′ō-măn-sĭ* [Gr. *ornis* or *ornītha*, a bird; *mantei′a*, divination]: divination by the flight of birds.

ORNITHOPTERUS, n. *awr-nĭ-thŏp′tér-ŭs* [prefix *ornitho-*; Gr. *pteron*, a wing]: in *palæon.*, an imperfectly known genus of Pterosaura (q.v.). It comprises forms having a wing-finger, with only two phalanges. It is possibly a transition form between the Reptilia and Aves, or it may be really referable to the latter class.

ORNITHORHYNCHUS, n. *ŏr′nĭth-ō-rĭng′kŭs* [Gr. *ornis* or *ornītha*, a bird; *rhungchos*, the snout of a hog]: fur-covered animal, web-footed, with a flat horny beak like a duck, peculiar to the fresh-water rivers of Australia and Tasmania—known also by the names of *duck-bill*, *water-mole*, and *platypus:* see DUCK-BILL.

ORNITHOSAURIANS: see PTERODACTYL.

ORNITHOSCELIDA, n. plu. *ŏr′nĭth-ō-skĕl′ĭ-dă* [Gr. *ornis* or *ornītha*, a bird; *skĕlos*, a leg, a foot]: an extinct group of reptiles having intimate relations both with avian and reptilian types.

ORNITHOTOMY, n. *awr-nĭ-thŏt′o-mĭ* [prefix *ornitho-;* Gr. *tomē*, a cutting]: in *nat. science*, the knowledge or practice of the anatomy of birds.

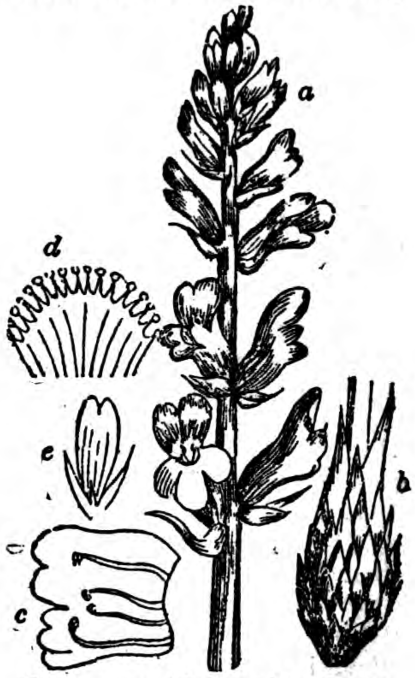
ORNITHURIC ACID, n. *awr-nĭ-thūr′ĭk ăs′ĭd* [prefix *ornith-;* Eng. *uric*]: in *chem.* $C_{19}H_{20}N_2O_4$. An acid extracted by alcohol from the excrement of birds living on food mixed with benzoic acid. It crystallizes in colorless, anhydrous needles, melting at 182°; slightly soluble in water, very soluble in hot alcohol, but insoluble in ether. It forms soluble salts with the alkalis and alkaline earths, insoluble salts with the oxides of the heavy metals. ORNITHURATE, n. a salt of ornithuric acid.

ORNUS, n. *awr′nŭs* [L.]: in *bot.*, flowering ash; a genus of *Fraxineæ*. *Ornus europæa* and *Ornus rotundifolia*, found in the s. of Europe, are both called the manna Ash.

ORO-, prefix *ŏr-o* [Gr. *oros*, a mountain]: pertaining to or connected with mountains; inhabiting mountains.

ORO-, prefix *ōr-ō* [L. *os*, *oris*, the mouth]: belonging to or connected with the mouth.

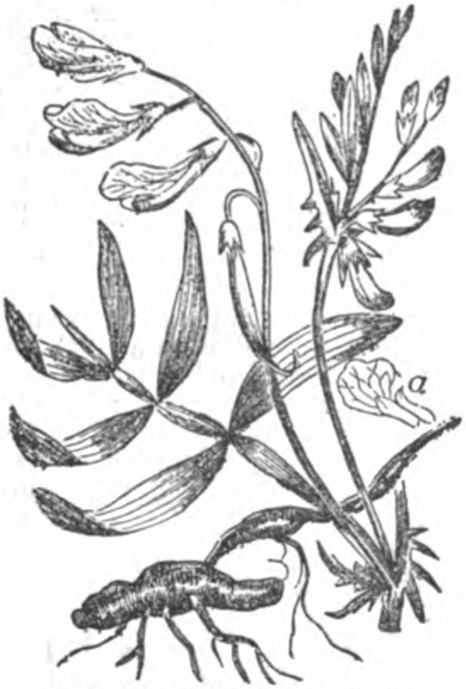
OROBANCHEÆ, *ŏr-o-băng′kē-ē*, or OROBANCHACEÆ, *ŏr-o-băng-kā′sē-ē:* natural order of exogenous plants, all herbaceous, and destitute of true leaves, but having their stems covered with brown or colorless scales. They all grow parasitically upon the roots of other plants. The calyx is divided, persistent, inferior; the corolla monopetalous, hypogynous, and irregular. The stamens are four, two long and two short; the ovary is 1-celled, seated in a fleshy disk, composed of two carpels, with one style. The fruit is capsular, inclosed within the withered corolla, 1-celled, 2-valved. The seeds are numerous, and very minute. There are about 120 known species, natives chiefly of temperate climates, and generally characterized by astringency and bitterness, on account of which some have been used in medicine (see CANCER ROOT). To some species of the genus *Orobanche*, or BROOM-RAPE, important medicinal virtues were formerly erroneously ascribed. The enlarged base or root-stock of a species of *Orobanche* is cooked or dried, and eaten by the Indians of n.w. parts of America.



Broom-rape (*Orobanche* ***rubra***):

a, **the top of the stem**, with bracts and flowers; ***b***, **the base of the stem, with scales**; *c*, the corolla, cut open, showing stamens; ***d***, **the middle segment of the lower lip of the corolla, magnified, showing the beautiful fringe of gland-bearing hairs**; *e*, capsule.

OROBUS, *ŏr′o-bŭs:* genus of plants of natural order *Leguminosæ*, suborder *Papilionaceæ*, allied to Vetches, and sometimes called BITTER VETCH; the style linear, downy beneath the stigma; the calyx obtuse at the base and oblique at the mouth; its upper segments deeper and shorter; the pod 1-celled, 2-valved; the leaves pinnate, without tendrils. The species are perennial herbaceous plants, natives chiefly of Europe. They afford good food for cattle. Of some species, the tubers have a sweet taste, resembling that of licorice; they are also bruised and steeped in water in parts of the Highlands of Scotland, to make a fermented liquor; they are well flavored and nutritious when boiled or roasted, and are used in Scotland, Holland, Belgium, and other countries.



Bitter Vetch (*Orobus tuberosus*):
a, standard of the corolla.

OROGRAPHY, n. *ŏ-rŏg′ră-fĭ* [Gr. *oros*, a mountain; *graphō*, I write]: the science which describes or treats of mountains with regard to their height, etc., and of the mountain-systems of the globe; also, in same sense, OROLOGY, n. *ō-rŏl′ŏ-jĭ* [Gr. *oros*, a mountain, and *logos*, discourse]. OROLOGICAL, a. *ŏ′rō-lŏj′ĭ-kăl*, pertaining to a description of the mountains and mountain-systems of the globe. OROLOGIST, n. *ō-rŏl′ŏ-jĭst*, one who describes mountains.

OROHIP′PUS: see HORSE, FOSSIL.

ORONTES, *ō-rŏn'tēz:* ancient name of a river in Syria, now called *Nahr-el-Asi.* It rises in the highest part of Cœle-Syria, near Baalbek, flows n. between the mountains of Libanus and Anti-Libanus, as far as the city of Antioch, then w. to the Mediterranean Sea, after a course of 240 m., passing by a cross-valley, through the mountains of the Syrian coast. Its lower course is remarkably beautiful, surpassing everything else in Syrian scenery. Its rocky banks are 300 ft. high, and the windings of the river show them to the greatest advantage. Myrtle-bushes, laurels, figs, wild-vines, arbutus, dwarf-oaks, and sycamores (*Acer pseudo-platanus*) are scattered in picturesque confusion. Here and there the eye catches a glimpse of some cavern mouth or ivy-matted precipice, while from the abyss beneath ascends the unceasing roar of the impatient stream. The country through which it flows is of great fertility, and in many parts well cultivated.

OROOMIAH, *ō-rô-mē'â*, or **URUMEYAH**, *ô-rô-mē'yâ:* town of Persia, 10 m. w. of the Lake of O., in a wide and fertile plain. It is surrounded by a mud wall and moat, but has no gates. Extensive fruit and vegetable gardens are within and without the walls. The houses of the wealthier citizens are lofty, spacious, and sumptuously furnished; and many of the poorer sort are tastefully adorned with flowers and vines. O. is the seat of a Nestorian bishop, and of a flourishing American mission: many of the people are Nestorian Christians. O. was anciently known as *Thabarma* or *Thebarmæ*, and was said to be the birthplace of Zoroaster (q.v.).—Pop. about 50,000.

OROOMI'AH (or **URUMEYAH**, or **URUMIJAH**, *ô-rô-mē'yâ*, or **URMEA**, *ôr-mē'â*) **LAKE**; called also the *Lake of Maragha* (q.v.), *Lake of Tabriz*, and, by the neighboring peoples, *Kapoutan* (Armen. *kapoit*, blue): principal lake of Persia; in the west of Azerbijan, about 34 m. w. from Tabriz. It is 4,320 ft. above sea-level, about 80 m. long from n. to s., has average width of 25 m.; area more than 1,900 Eng. sq. m. It is one of that class of lakes which receive, but do not emit, streams; and though its feeders include such rivers as the Aji-su, 180 m. long, the Jaga-tu, 140 m., and the Ta-tu, 90 m., its average depth is only 12 ft. The water is largely impregnated with saline substances (according to one authority, the salts constitute 25 per cent. of the whole weight), and is so heavy as to be little ruffled by the strongest wind. No fish or mollusca are found in it. Six large isles, and a multitude of islets and rocks, show themselves just above its surface, being mostly grouped together near its centre. The lake is fast drying up, leaving a gradually widening beach of thick saline incrustation, which supplies with salt the whole of Kurdistan. The lake was known in ancient times as *Matiana* or *Mantiana*.

OROSIUS, *ō-rō'shĭ-ŭs*, PAULUS: Spanish presbyter and historian: born at Tarragona, toward the end of the 4th c. He went to Africa about 413, where he made the acquaintance of St. Augustine; and thence to Palestine, to study under St. Jerome, then living at Bethlehem. He finally settled in n. Africa, where probably he died, at a date not known. His chief work, the *Historiarum adversus Paganos Libri* 7, begins with the creation and goes down to 417. It is apologetic in design, being intended to refute the notion, then current among the pagans, that the misfortunes of the Roman empire and the wretchedness of the great masses were owing to the anger of the gods at the abandonment of their worship and the profanation of their altars. The work is a trivial, inaccurate, uncritical miscellany of facts, culled from such second-rate authorities as Justin and Eutropius; the style is elegant, but also, as Bacon says, 'watery'. Yet it has obtained a place in literature from being a favorite text-book of universal history during the middle ages, and had the honor of being translated into Anglo-Saxon by the English Alfred. Some manuscripts bear the puzzling title of *Hormesta* or *Ormista*, conjectured by some to be a corruption of Or. M. ist., that is, *Orosii Mundi Historia* (Orosius's History of the World). The editio princeps of the work appeared at Vienna 1471; the best ed. is that of Havercamp (Lug. Bat. 4to, 1738). Other writings of O.'s are *Liber Apologeticus de Arbitrii Libertate*, an anti-Pelagian treatise; *Commonitorium ad Augustinum*, an explanation of the state of religious parties in Spain in his time. Editions of the *Historia* were published by Havercamp (1738 and 67) and Zangemeister (1881). See Mörner's work on Orosius.

OROSZHAZA, *ō-rōsh-hâ'zōh:* thriving town of Hungary, county of Békés Csanad, 31 m. n.e. from Szegedin. Pop. (1880) 18,032.

OROTAVA, *ō-rō-tâ'vâ:* town on the n. coast of Teneriffe, one of the Canary Islands. It is below the Peak, in one of the most fertile, pleasant, and healthful districts in the world. It contains several beautiful churches, the residence of the governor, and the citadel. There is fishery, and trade in wine. Pop. about 9,000.

OROTUND, a. *ŏr-ō-tŭnd'* [corrupted from L. *orĕ rotun'do*, with a full, round, or polished mouth—from *os*, a mouth—gen. *oris; rotundus*, round]: said of the utterance of letters or words with fulness, clearness, and strength. **OROTUN'DITY**, n. *-dĭ-tĭ*, the manner of uttering words with fulness and clearness.

ORPHAN, n. *ŏr′făn* [OF. *orphanin*—from mid. L. *orphănus*—from Gr. *orphănos*, deprived of either parent; connected with L. *orbus*, bereft: F. *orphelin*, an orphan]: a child bereaved of father or mother, or of both—more usually of both: ADJ. bereaved of parents. ORPHANAGE, n. *ŏr′făn-āj*, state of an orphan: an asylum for orphans. ORPHANED, a. *ŏr′fănd*, bereft of parents. ORPHANS, in *chh. hist.*, a party of Hussites who refused to follow Procopius or to elect any special leader after the death of Ziska, and called themselves orphans because they had lost their spiritual father. OR′PHANS' COURT, n. a court in some of the states, having jurisdiction over the persons and estates of orphans.

OR′PHAN HOUSE: see MÜLLER, GEORGE.

ORPHEAN, a. *awr-fē′ăn* [L. *Orpheus*, famous poet and musician of antiquity]: pertaining to Orpheus, *awr′fūs*; musical; poetical. ORPHEON, n. *awr′fĕ-ŏn*, a musical instrument. ORPHIC, a. *awr′fĭc*, of or pertaining to Orpheus; Orphean; belonging to or connected with Orphism. ORPHISM, in *compar. religion*, the doctrines of a Greek school or sect, said to have been founded by the mythic Orpheus (q.v.).

ORPHEUS, *awr′fūs* or *awr′fē-ŭs* (supposed by some to be the Vedic Ribhu or Arbhu, an epithet both of Indra and the Sun): mythic figure, whose name is of frequent occurrence in anc. Greek lore. The early legends call him a son of Apollo and the Muse Calliope, or of Œagrus and Clio, or Polymnia. His native country is Thracia, where many different localities were pointed out as his birthplace—e.g., the Mounts of Olympus and Pangæus, the river Enipeus, the promontory of Serrhium, and several cities. Apollo bestows on him the lyre, which Hermes invented, and by its music O. moves men and beasts, the birds in the air, the fishes in the deep, the trees, and the rocks. He accompanies the Argonauts in their expedition, and the power of his music wards off all mishaps and disasters, rocking monsters to sleep and stopping cliffs in their downward rush. His wife, Eurydice (? = Skr. Uru, Dawn), is bitten by a serpent (? = Night), and dies. O. follows her into Hades; and so powerful are his 'golden tones,' that even stern Pluto and Proserpina are moved to pity; while Tantalus forgets his thirst, Ixion's wheel ceases to revolve, and the Danaïdes stop in their wearisome task. He is allowed to take her back into the 'light of heaven,' but he must not look around while they ascend. Love or doubt, however, draws his eyes toward her, and she is lost to him forever (? = first rays of the sun gleaming at the dawn make it disappear or melt into day). His death is sudden and violent. According to some accounts, it is the thunderbolt of Zeus that cuts him off, because he reveals the divine mysteries; according to others, it is Dionysus, who, angry at his refusing to worship him, causes the Menades to tear him to pieces, which pieces are collected and buried by the Muses in tearful piety at Leibethra, at the foot of Olympus, where a nightingale sings over his grave. Others, again, make the Thracian women divide his limbs between them, either from excessive madness of unrequited love, or from anger at his drawing their husbands away from them. Thus far, legend and art, in manifold hues and varieties and shapes, treat of O. the fabulous. The faint glimmer of historical truth hidden beneath these myths becomes clearer in those records which speak of O. as a divine bard or priest in the service of Zagreus, the Thracian Dionysus, and founder of the Mysteries (q.v.); as the first musician, the first inaugurator of the rites of expiation and of the Mantic art, the inventor of letters and the heroic meter, and of everything that was supposed to have contributed to civilize and to initiate into a more humane worship the primitive inhabitants of Thracia and all Greece: a task to which O. was supposed to have devoted his life after his return with the Argonauts. A kind of monastic order sprang up in later times, calling itself after him, which combined with a sort of enthusiastic creed about the migration of souls, and other mystic doctrines, a semi-ascetic life. Abstinence from meat (not from wine), frequent purifications and other expiatory rites, incantations, the wearing of white garments and similar things —not unlike some of the Essenic manners and customs —were among their fundamental rules and ceremonies. But after a brief duration, the brotherhood, having during the last days of the Roman empire passed through the stage of conscious and very profitable jugglery, sank into oblivion, together with their 'orpheotelistic' formulas and sacrifices, and together with those joys of the celestial, and never-ending punishments of the infernal, regions which they promised to their rich dupes, according to the sums which they grudged or bestowed upon them.

O. has given the name to a special literature called the Orphic, the real origin of which, however, is (according to Ottfried Müller), like Orpheus's own history, 'unquestionably the darkest point in the entire history of early Greek poetry.' Like Olen, Linus, Philammon, Eumolpus, Musæus, and other legendary singers of prehistoric Greece, O. is supposed to have been 'the pupil of Apollo and the Muses,' and to have first composed certain hymns and songs used in the worship of a Dionysus, dwelling in the infernal regions, and in the initiations into the Eleusinian mysteries. A mere 'abstraction,' as it were, he was called the first poet of the heroic age, and though not mentioned before Ibycus, Pindar, Hellanicus, and the Athenian tragedians, he was yet placed anterior to both Homer and Hesiod. The fragments current under his name were collected first at the time of the Pisistratidæ, chiefly by Onomacritus; and these fragments grew under the hands of the Orphic brotherhood, aided by the Pythagoreans, to a vast literature of sacred mythological songs sung at the public games, chanted by the priests at their service, worked out for dramatic and pantomimic purposes by the dramatists, commented upon, philosophized upon, and 'improved' by grammarians, philosophers, and theologians.. Although authorities like Herodotus and Aristotle had already combated the supposed antiquity of the so-called Orphic myths and songs of their day, yet the entire enormous Orphic literature which had grown out of them retained its 'ancient' authority, not only with both the Hellenists and the church Fathers of the 3d and 4th c. after Christ (who, for their individual, albeit opposite, purposes, referred to it as the most authentic primitive source of Greek religion, from which Pythagoras, Heracleitus, Plato, had drawn their theological philosophy), but down almost to the last generation, when it was irrefutably proved to be in its main bulk, as far as it has survived, the production of those very 3d and 4th centuries, raised on a few scanty, primitive snatches. The most remarkable part of the Orphic literature is its Theogony, based mainly on that of Hesiod, with allegorizing and symbolizing tendencies, and with a desire to simplify the huge Olympic population by compressing several deities into a single one: see THEOGONY. Yet there is one figure which stands out here prominently—viz., Zagreus, the horned child of Zeus by his own daughter Persephone, who, killed by the Titans at the bidding of Here, is reborn by Semele as Dionysus (see BACCHUS).

Besides the fragments of the Theogony which have survived, embedded chiefly in the writings of the Neo-Platonists, are the *Argonautica*, a poem of the Byzantine period, consisting of 1,384 hexameters; further, a collection of 87 or 88 liturgical hymns; a work on the virtues of stones, called *Lythica*, etc. Other poems belonging to the Orphic Cycle, of which, however, only names have survived in most instances, are *Sacred Legends*, ascribed to Cercops; a Poem on Nature, called *Physica*, probably by Brontinus; *Bacchica*, supposed to be written by Avignota, daughter of Pythagoras; *Minyas*, or Orpheus's descent into the Hades; and other poetical productions by Zopyrus, Timocles, Nicias, Persinus, Prodicus, etc. The best edition of the Orphic fragments is that of G. Herrmann (Leipzig 1805). The hymns have repeatedly been translated into English by T. Taylor and others. See Lobeck's *Aglaophamus* (1829); Gerhard, *O. und die Orphiker* (1861); and Schuster, *De Theogoniæ Orphicæ Indole* (Leipzig 1869).

ORPHREY, n. *or'frĭ* [F. *orfroi*, embroidered cloth-of-gold—from L. *aurum Phryg'ium*, Phrygian gold, that is, cloth embroidered in gold, for which the Phrygians were famous]: embroidered bands attached to an ecclesiastical vestment, especially to the cope from the neck downward in front.

ORPIMENT, n. *ŏr'pĭ-mĕnt* [a corruption of the L. *aurĭpigmen'tum*—from *aurum*, gold; *pigmen'tum*, a paint]: yellow sulphide of arsenic; the color called king's yellow: see ARSENIC.

ORPIN, n. *ŏr′pĭn* [contr. of *orpiment:* F. *orpin*]: a yellow or orange color of various degrees of intensity.

ORPINE, n. *ŏr′pĭn* [F. *orpin*, a plant: a corruption of *orpiment*, from the yellow color of some of the species]: a wild herbaceous plant with fleshy leaves, found abundantly in some parts of England, called also the rose-plant; the *Sēdum telēphĭŭm*, ord. *Crassulācĕæ*, found growing upon stones, rocks, walls, and roofs of houses, and hence also called stone-crop.

ORR, *awr*, HUGH: 1717, Jan. 13—1798, Dec. 6; b. Lochwinoch, Scotland. When 20 years of age he came to Easton, Penn., where he remained a year, and then settled in Bridgewater, Mass. He had learned the trade of gunsmith, and soon began making scythes and axes. He put up the first trip-hammer, and was the first manufacturer of edged tools and firearms in the region. As early as 1748, he made 500 muskets for the province. A few years later, he invented a machine for separating the fibre from the woody stem of flax, and about 1786 he invented machines for manufacturing cotton. The legislature gave financial aid in the construction of the latter machines, and rewarded O. and his employés for their public spirit. During the revolution, O. made several pieces of artillery and cast a large number of cannon-balls. For several years he was a member of the state senate. He died at Bridgewater.

ORRA, a. *ŏr′rȧ* [see ORT]: in *Scot.*, odd; not matched; applied to a man employed at odd jobs about a farm.

ORRERY, n. *ŏr′rĕ-rĭ* [after the Earl of *Orrery*]: machine constructed for the purpose of exhibiting the motions of the planets round the sun, and of the satellites round their primaries, which was in high repute during the 18th and beginning of the 19th c., though now regarded as a mere toy. It was a combination of the old *Planetarium* (q.v.), with other machines which showed the motions of the earth, moon, and planetary satellites. Though the construction of a machine which would exhibit accurately the motions, distances, and magnitudes of the planets is impossible, yet an O. is of some use as giving a general notion of the planetary motions. A number of iron tubes equal in number to the planets, and of different dimensions, are placed one within the other; their lengths being arranged so that the innermost tube projects at both ends beyond the one next to it, that one similarly projects beyond the third, and so on. At one end of each tube, a rod is fixed at right angles, and a ball or lamp attached to its end; the lengths of the rods being proportional (or at least supposed to be so) to the radii of the planetary orbits. The other ends of the tubes form the axes of toothed wheels, which are connected either directly, or by combinations of toothed wheels, with a winch. The several combinations of wheels are so adjusted that the velocity of revolution of the rods is proportional to the times of revolution of the planets. On turning the winch, the whole apparatus is set in motion, and the balls or lamps (representing the planets) revolve round the centre, which is a fixed lamp (representing the sun), at different distances and with varying velocities. There are many nice arrangements, such as for producing elliptic motion, but these need not be described.

ORRIS, n. *ŏr′rĭs* [a corruption of *iris:* It. *irios* or *ireos*, orris-root]: name of certain species of the plant *iris* or flag-flower; natives of s. Europe, belonging to the division of the genus having bearded flowers, sword-shaped leaves, and scapes taller than the leaves—viz., *I. Florentina*, a species with white flowers; *I. pallida*, which has pale flowers; and *I. Germanica*, which has deep purple flowers. See IRIS. The flowers of all these species are fragrant. *I. Germanica* extends further n. than the other species, and its root is sometimes said to be more acrid. —*Orris-Root* is the dried root-stock (*rhizome*) of these species of *iris:* it was formerly used in many medicinal preparations as a stimulant, but is now almost entirely disused. It is sometimes chewed to sweeten an offensive breath. Its chief use is in perfumery. It has a pleasant smell of violets, which it acquires in drying. Hair and tooth powders, and oils, are often scented with it. A tincture of it, used as a scent, is often sold as *Essence of Violets.*

ORSAY, ALFRED GUILLAUME GABRIEL, Comte DE: see D'ORSAY.

ORSINI, *or-sē′nē*, FAMILY OF: one of the most famous families of the Italian nobility. It descended from a Roman family of rank and wealth which became prominent in the early part of the twelfth century. For brilliant service in the army, Giordano was created a cardinal 1145, and was sent by the pope on a mission to the German emperor 1152, his nephew, Matteo, meanwhile being prefect of Rome. A little later, one of the members of the family became a senator, and another, Celestine III., became the pope. Matteo the Great was senator, and secured large landed interests. Toward the close of the thirteenth century, Giovanni became pope, taking the name of Nicholas III., made powerful alliances, greatly increased the power and fortunes of the family, and brought it into sharp rivalry with the Colonnas. In the fierce quarrels of the Guelfs and the Ghibellines, the O. sided with the former, and the Colonnas with the latter, The O. had a castle on Lake Bracciano, and various other strongholds. Both the O. and the Colonna families incurred the enmity of Pope Alexander VI., and suffered greatly therefrom. With the exception of the Neapolitan, the various branches of the O. family have decayed. Pope Benedict XIII. belonged to this branch. The family seat is retained at Rome; but the principal residence is at Naples, where a beautiful palace is occupied.

ORSINI, *or-sĕ̄′nē*, FELICE: Italian revolutionist, remembered for his atrocious attempt on the life of the French emperor, Napoleon III.: 1819–1858, Mar. 13; b. Meldola, in the States of the Church; son of a conspirator, and early initiated into secret societies. Before he had reached his 20th year, he was condemned to the galleys for life. The amnesty of Pius IX. (1846) restored him to liberty, but he was continually engaged in revolutionary plots as an agitator in the interest of insurrection. He escaped from prison 1856, and found refuge in England; whence, near the end of 1857, he went to Paris to assassinate Louis Napoleon, whom he reckoned the great obstacle to the revolution in Italy. His associates in this diabolical design were persons named Pieri, Rudio, and Gomez. Providing themselves with bombs, they took up their station in a house close by the opera, and on the evening of 1858, Jan. 14, just as the carriage containing the emperor and empress was drawing up, they threw three of the deadly missiles under the carriage. The explosion wounded several people, one or two mortally; but the emperor and empress were unhurt. The assassins were arrested, tried, and sentenced; O., Pieri, and Rudio to capital punishment, Gomez to hard labor for life. Rudio's life was spared, at the intercession of the empress, but Pieri and O. were beheaded.

ORSOVA, *ŏr-sō′vâ:* name of two towns at the Iron Gates of the Danube (q.v.).—OLD O., a Hungarian town, is on an island, and is a station for the Danube steamers. Pop. 1,200.—NEW O., on the Servian side, is a fortified town. Pop. 3,000.

ORT, n. *ŏrt;* generally in plu. ORTS, *ŏrts* [prov. Dan. *ovred;* Dut. *oorete*, fragments, remains: Fris. *orten*, to leave remnants in eating: Low Ger. *ort;* Scot. *worts*, fragments]: fragments and rejected parts that are left by an animal in feeding; the odds and ends that fall to the ground in working with any material: see ODDS AND ENDS (under ODD), note.

ORTELIUS, *or-tā′lĭ-ûs* (or OR′TELL, or OERTEL, *ŏr′tĕl*), ABRAHAM: 1527, Apr. 4—1598, June 28; b. Antwerp: one of the principal geographers of his time. He travelled in the Netherlands, Germany, England, Ireland, and Italy; was a close student, and issued 1570 the earliest modern atlas. This work contained nearly 100 maps, and passed through several editions during his life. Though the maps were imperfect, the text was carefully prepared. The value of the work was recognized, and led to the appointment of O. as geographer to Philip II. of Spain 1575. He issued a valuable work on ancient geog. 1578, and several other works which attained wide popularity. Of nearly all his books, second editions were demanded. He d. at Antwerp.

ORTHEZ, *or-tā′:* small town of France, dept. of Basses-Pyrénées, on the right bank of the Gave de Pau, 37 m. e. of Bayonne. Pop. about 5,000. The castle of Moncada, now reduced to a few ruined walls, overtopped by one stately tower, was built here 1240 by Gaston de Foix. In the immediate vicinity of the town, the British, under Wellington, gained a grand and decisive victory over the French, under Soult, 1814, Feb. 27.

ORTHIS, n. *ŏr′thĭs* [Gr. *orthos*, straight] : in *geol.*, large genus of fossil brachiopodous mollusca, found in the paleozoic rocks, most abundantly in the Silurian rocks, but ranging upward to the Permian series. The genus contains more than 100 species. ORTHISINA, n. *ŏr′thĭ-sī′nă*, a sub-genus of preceding. ORTHITE, n. *ŏr′thīt*, a mineral of a blackish-brown color, occurring in straight, needle-shaped, or columnar masses in the granites of Scandinavia.

OR′THO-, prefix [Gr. *orthos*, straight, upright] : prefix used with words derived from the Greek and expressing straightness, uprightness, correctness, or regularity.

ORTHOCANTHUS, n. *ŏr′thō-kăn′thŭs* [Gr. *orthos*, straight; *akantha*, a thorn or spine] : in *geol.*, a genus of straight, cylindrical, fossil fin-spines, found in the Carboniferous formation.

ORTHOCERAS, n. *ŏr-thŏs′ėr-ăs*, or ORTHOCERATITE, n. *ŏr′thō-sĕr′ă-tīt* [Gr. *orthos*, straight; *keras*, a horn] : extensive genus of cephalopodous mollusca, found in the paleozoic rocks, from the Lower Silurian to the Trias; having straight, chambered shells tapering to a point like a horn. It is nearly allied to the Nautilus, and is indeed, in its simplest forms, nothing more than an unrolled and straightened nautilus. The shell is straight, the siphuncle central, and the body chamber small. The members of the genus are the most widely distributed and the most abundant of any paleozoic fossils. Nearly 200 species have been described; but a considerable number of these have been separated into sub-genera, characterized chiefly by the form and size of the siphuncle. The family is termed ORTHOCERATIDÆ, n. *ŏr′thō-sĕr-ăt′ĭ-dē.*

ORTHOCLASE, n. *ŏr′thō-klāz* [Gr. *orthos*, straight; *klasis*, a fracture] : a mineralogical term for potash felspar, from its straight, flat fracture.

ORTHODOX, a. *ŏr′thŏ-dŏks* [F. *orthodoxe*—from Gr. *orthodŏxĭă*, sound opinion—from *orthos*, right, true; *doxa*, an opinion] : sound in the Christian faith, as taught in the formularies of any particular church; sound in opinion and doctrine; not heretical; not heterodox. ORTHODOXY, n. *ŏr′thŏ-dŏks-ĭ*, soundness of opinion or doctrine. The word has different meanings in different countries and times. In this country it is familiarly applied to a positively Calvinistic doctrinal system; in other countries to ecclesiastical organizations or doctrinal tenets as established by law.

ORTHODROMICS, n. plu. *ŏr′thō-drŏm′ĭks* [Gr. *orthos*, straight; *dromos*, a course]: the art of sailing on the arc of a great circle, being the shortest distance between any two points on the earth's surface; great-circle sailing; also called ORTHODROMY, n. *ŏr-thŏd′rŏ-mĭ*. OR′THODROM′IC, a. *-ĭk*, pertaining to great-circle sailing.

ORTHOEPY, n. *ŏr-thō′ĕ-pĭ* [Gr. *orthoepeia*, correct pronunciation—from *orthos*, right; *epos*, a word: F. *orthoépie*]: branch of grammar that treats of the correct pronunciation of the words of a language. OR′THOEP′IC, a. *-ĕp′ĭk*, or OR′THOEP′ICAL, a. *-ĭ-kăl*, pertaining to correct pronunciation. ORTHO′EPIST, n. *-ĕ-pĭst*, one well skilled in pronunciation.

ORTHOGAMY, n. *ŏr-thŏg′ă-mĭ* [Gr. *orthos*, right, straight; *gamĕō*, I marry]: in *bot.*, the method of fertilization in plants in which the pollen falls directly on the stigma.

ORTHOGNATHOUS, a. *ŏr-thŏg′nă-thŭs* [Gr. *orthos*, straight, erect; *gnathos*, a jaw]: possessing a skull in which the front of the head is in a line with the jaws, and does not recede backward from them; having a form of head in which the face is in a line with the forehead.

ORTHOGON, n. *ŏr′thō-gŏn* [Gr. *orthos*, right; *gōnĭă*, an angle]: a rectangular figure. ORTHOGONAL, a. *ŏr-thŏg′ŏ-năl*, rectangular; at right angles.

ORTHOGRAPHY, n. *ŏr-thŏg′ră-fĭ* [Gr. *orthographĭă*—from *orthos*, straight, correct; *graphō*, I write: OF. *ortographie*]: the part of grammar which teaches how words should be spelled; the art of writing words with their proper letters according to the best use (see below): in *arch.*, representation of the front or elevation of a building, or of a section of it. ORTHOGRAPHIC, a. *ŏr′thō-grăf′ĭk*, or OR′THOGRAPH′ICAL, a. *-ĭ-kăl*, written with their proper letters: in *arch.*, delineated according to the elevation, not the ground-plan; in *geom.*, consisting of straight lines on a plane at right angles to it. OR′THOGRAPH′ICALLY, ad. *-lĭ*. ORTHOG′RAPHER, n. *-thŏg′ră-fėr*, or ORTHOG′RAPHIST, n. *-ră-fĭst*, one who spells according to the rules of grammar.

ORTHOG′RAPHY: branch of grammar that treats of the elementary sounds of a language, the signs or letters by which they are represented in writing, and the combinations of these signs to represent words; it includes also the right dividing of words into syllables (as when a word has to be divided at the end of a line), and punctuation. In a more restricted sense, O. is synonymous with the art of correct spelling. No part of grammar is less satisfactory than this. All alphabets were from the first both defective and redundant, and therefore inadequate to represent exactly the elementary sounds of the languages to which they were applied (see ALPHABET: LETTERS AND ARTICULATE SOUNDS). The first attempts, then, at writing any language must have exhibited great diversity of spelling. Wherever an extensive literature has sprung up among a people, and language itself been made a study, there a greater or less uniformity of spelling has, by tacit convention or otherwise, become established for a time. Such was the case with Latin in the time of the Cæsars, with High German about the 12th and 13th c., and with English (Anglo-Saxon) in the days of Alfred and for some time afterward. But though language, as depicted to the eye, may be fixed for a time, the spoken tongue, being a living organism, cannot be thus petrified. A written literature may modify, and in some degree retard, but cannot altogether arrest, that incessant change and evolution to which all spoken tongues are subject. The breaking up of the Anglo-Saxon, in its transition into modern English, brought necessarily a period of orthographic chaos. Never was the lawlessness greater than during one of the brightest periods of the literature—namely, the Elizabethan period. Then, and for a long time afterward, all perception of the real powers of the letters seems to have been lost, and caprice ruled. Not only were words spelled differently by different persons, but even among the best-educated classes the same person would spell the same word (even his or her own name) half-a-dozen ways in the same page. Among the classic writers of the Queen Anne period, some degree of uniformity began to establish itself, and this was afterward further confirmed by the publication of Johnson's Dictionary, since which time the alterations have been comparatively small. The modern spelling thus established conformed itself only partially to the changes that the spoken language had undergone. Of the letters that had become silent through the wearing away and collapse of the spoken words, some were omitted and others retained, with little attention to consistency, or to any principle now discernible. Hence, in the English language as now written and spoken, there is in general so imperfect a correspondence between the sound of a word and the sounds of the several letters written to represent it, that the spelling of each individual word has, in a manner, to be learned by itself. By no possible rules can a learner be taught when he sees the groups of letters *n-o-w*, *p-l-o-u-g-h*, *e-n-o-u-g-h*, to make out the sounds or spoken words that these groups actually represent; or, conversely, when he hears the words spoken, to find out what letters they are to be represented by. This fact presents great difficulty to foreigners in the acquisition of English; which, in other respects, is one of the simplest and most easily learned languages in the world. The O. of English is to be acquired only by observation and practice. There are no *rules* in the proper sense of the word; the only effective assistance that can be given in this matter is to bring together, under some kind of classification, the words most frequently misspelled. See PHONETIC WRITING.

ORTHOMETRY, n. *ŏr-thŏm'ĕ-trĭ* [prefix *ortho-;* Gr. *metron*, a measure]: the art of composing or constructing verses correctly; correct versification.

ORTHOPÆDIA, n. *ŏr'thō-pē'dĭ-ă* [Gr. *orthos*, straight; *paideia*, the rearing of children]: the prevention and cure of deformities of the human body, especially in children.

ORTHOPEDIST, n. *ŏr-thŏp'ĕ-dĭst* [Gr. *orthos*, straight; L. *pes* or *pedem*, a foot]: one who cures or remedies deformities in the limbs or feet.

ORTHOPHOSPHORIC, a. *ŏr'thō-fŏs-fŏr'ĭk* [Gr. *orthos*, straight, correct, and Eng. *phosphorus*]: applied to common phosphoric acid, which contains three molecules of water.

ORTHOPNŒA, n. *ŏr'thŏp-nē'ă* [Gr. *orthos*, straight; *pnĕō*, I breathe or pant]: a diseased state in which the difficulty of breathing is increased by stooping, or on lying down.

ORTHOPTERA, n. plu. *ŏr-thŏp'tėr-ă* [Gr. *orthos*, straight; *ptera*, wings]: order of insects which have their two outer wings disposed in straight folds when at rest, as the grasshopper and house-cricket; also ORTHOP'TERS, *-tėrz*, and ORTHOP'TERANS, n. plu. *-ănz*. ORTHOP'TEROUS, a. *-ŭs*, of or pertaining to the orthoptera; folding the wings straight.—The *Orthoptera* form order of mandibulate insects, in many respects resembling the *Coleoptera* (q.v.), but having the wing-covers softer and generally leathery and flexible. The wing-covers also often overlap on the back when at rest, or meet at an angle like the roof of a house. The wings are broader than the wing-covers, and fold in a fan-like manner. A few species are wingless. The body is generally elongated. The antennæ are almost always filiform and many-jointed. The eyes are usually very large, and there are also in most species two or three stemmatic eyes. The mouth much resembles that of the Coleoptera, but the maxillæ are terminated by a horny denticulated piece, and covered by a *galea;* and the interior of the mouth exhibits a distinct fleshy piece, which some regard as a kind of tongue. The O. undergo only a semi-metamorphosis, the larva and pupa much resembling the perfect insect, except in the lack of wings; which, however, begin to be developed in the pupa. The Earwig family differs so much from other O. as to have been constituted by some entomologists into a distinct order: see EARWIG. The O. are divided into two sections, *Cursoria* and *Saltatoria;* the first with legs adapted for running, as the Mantis family, Spectre Insects, Walking Sticks, Leaf Insects, etc.; the second having the hinder legs very large and strong, generally adapted for leaping, as Grasshoppers, Locusts, Crickets, etc.

ORTHOSPERMÆ, n. plu. *ŏr'thō-spėr'mē* [Gr. *orthos*, straight; *sperma*, seed]: in *bot.*, seeds which have the albumen flat on the inner face, neither involute nor convolute.

ORTHOSTICHIES, n. plu. *ŏr′thō-stĭk′ĭz* [Gr. *orthos*, straight; *stĭchos*, a series, a row]: in *bot.*, applied to the several vertical rows formed by the leaves in a spiral phyllotaxis.

ORTHOTROPAL, a. *ŏr-thŏt′rō-păl*, or ORTHOT′ROPOUS, a. *-rō-pŭs* [Gr. *orthos*, straight; *tropos*, direction—from *trepō*, I turn]: in *bot.*, having the embryo in a seed lying straight toward the hilum or eye, as in the bean—applied to the ovule with foramen opposite to the hilum.

ORTIVE, a. *ŏr′tĭv* [L. *ortus*, arisen]: rising or eastern.

ORTOLAN, n. *ŏr′tō-lăn* [F. *ortolan;* OF. *hortolan*—from It. *ortolano*, a gardener—from mid. L. *hortulānus*, of the garden—from L. *hortus*, a garden], (*Emberiza hortulana*): small bird of s. Europe, much esteemed for the delicacy of its flesh—so called because it frequents the hedges of gardens. It is a species of Bunting (q.v.), much resembling the yellow-hammer, and not quite equal to it in size. The adult male has the back reddish brown, wings dusky black and rufous brown; tail dusky black, some of the outer tail-feathers with a patch of white on the broad inner web; chin, throat, and upper part of the breast yellowish green; other under parts reddish buff-color. The plumage of the female is of less vivid hues. The O. occurs in great flocks in s. Europe and n. Africa. Even in s. Europe it is a summer bird of passage; but its migrations extend as far n. as Lapland, though in Britain it is very rare, and of only accidental occurrence. It has no song, but merely a monotonous chirping note. It frequents bushy places, but often makes its nest on the ground in corn-fields, particularly where the soil is sandy. No bird is so highly esteemed by epicures, and vast numbers are used for the table. It is taken chiefly by nets, with the aid of decoy-birds, and after being taken is fattened on millet and oats, in rooms dimly lighted by lamps. Thus treated, it becomes excessively fat, sometimes so as to die of obesity; and attains a weight of three ounces. Great numbers of ortolans, potted and pickled, are exported from Cyprus. The O. resembles its congener the Yellow-hammer, but has a coloring less bright. In French the

Ortolan (*Emberiza hortulana*).

name O. is applied also to the Eng. Snow-bunting, the Rice-bird or Bobolink of N. America, noted for its delicious flavor, and to other birds not so nearly allied.

ORTONA, *ōr-tō'nâ:* town of s. Italy, on the Adriatic, in the province of Chieti, 14 m. e. of the town of Chieti, 8 m. n. of Lanciano. It gives title to a bishop, and contains a cathedral and other religious edifices. Its port has ceased to exist, and vessels must now anchor about a mile from the town in unsheltered roads, where, however, the water is deep and the bottom good. Wine is extensively grown, and has a local reputation as the best in this part of Italy. Pop. about 7,000.

ORTS, n. plu.: see ORT.

ORTYG'IA (island): see DELOS.

ORTYG'IA (city): see EPHESUS.

OR'TYX: see VIRGINIAN QUAIL.

ORURO, *ō-rô'rō*, or, in the complete form, SAN FELIPE DE ASTURIA DE ORURO: town of Bolivia, cap. of the dept. of O., and of late made the cap. of the Bolivian govt.; about nine m. e. from Desaguadero, 32 m. n. from the n. extremity of the salt lake of Desaguadero, on an affluent of the river of the same name which falls into that lake. It is 12,015 ft. above the level of the sea, at the base of a very high mountain; but on the other side of the town is a large plain, often covered with saline efflorescences. The soil of the whole dept. is saline, and not fertile, but its mineral wealth is great. Gold, silver, copper, tin, iron, lead, and antimony are among its products. O. was founded 1590, in consequence of the discovery of silver mines, which proved more productive than any in Bolivia, except those of Potosi. It soon became a wealthy and flourishing city with 70,000 inhabitants; but in consequence of the diminished productiveness of its mines, and of the anarchy in the country after the Revolution, its pop. declined, and is now only 7,980.

ORUS, n. *ō'rŭs*, or HORUS, n. *hō'rŭs:* an Egyptian god, son of Isis and Osiris, frequently appearing in Egyptian paintings sitting on the lap of Isis.

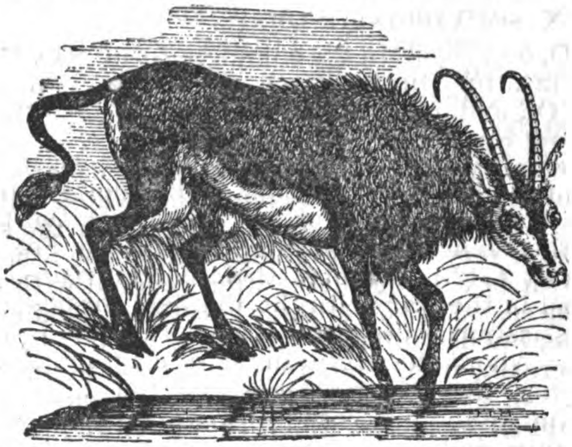
ORVIETO, *ōr-rē-ā'tō:* city in the province of Umbria (Perugia), a province included in the former Papal States, but now part of the kingdom of Italy; on the right bank of the Paglia, 8 m. n.e. of Lake Bolsena, 60 m. n.n.w. of Rome. It occupies a strong position on a steep hill, is well built and surrounded with walls. It has been the seat of a bishop since 509. The cathedral, a beautiful specimen of the Italian Gothic, one of the most richly decorated edifices in Italy, is of black and white marble, was begun 1290 and completed about the middle of the 14th c. The façade is unsurpassed in richness of material, and in the beauty of its mosaics, sculptures, and elaborate ornamentation. The interior also is magnificently decorated with sculptures and paintings. The other chief buildings are St. Patrick's Well, and several palaces. The people trade in corn, cattle, and silk, and a delicate white wine esteemed at Rome. Pop. 7,500.

O., called in the time of the Longobards *Urbs Vetus*—of which its present name is a corruption—has been the residence and retreat in turbulent times of more than 30 popes. The city is evidently of Etruscan origin, but of its early history nothing is known.

ORYCTEROP′IDÆ: see Aard-vark.

ORYCTOLOGY, n. *ŏr′ĭk-tŏl′ŏ-jĭ* [Gr. *oruktos*, dug up; *logos*, speech]: the study of objects dug out of the earth, as antiquities, skeletons, and fossils.

ORYX, n. *ō′rĭks:* variety of s. African antelope, having the mane and tail of the horse, the head and coloring of the ass, and the legs and feet of the antelope, with long horns tapering backward. The name O. was given by the ancients to a species of antelope, native of n. Africa, often represented on the monuments of Egypt; and as these representations are almost always in profile, it is generally made to appear as having only one horn, thus probably contributing to the fable of the unicorn: indeed, all the older figures of the unicorn have considerable resemblance to this kind of antelope. The name *Antilope oryx* was given by Pallas to the Gems-bok (q.v.), an antelope certainly much resembling the O., but found only in s. Africa; and it is now generally believed that the true O. of the ancients is a species known also as the Algazel (*Antilope Gazella*, or *Oryx bezoartica*), common in n. Africa.



Oryx.

ORY′ZA: see Rice.

OS, n. *ŏs*, or Osar, n. *ō′zâr:* a Swedish term for the long hillocks or mounds of drift gravel and sand which are so abundantly scattered over Sweden and the islands of the Baltic—called *kaims* in Scotland, and *eskirs* in Ireland.

OSA'CA, or Ozaka, *ō-zâ'kâ:* city of Japan, n. lat. 35° 5′, about 20 m. from its seaport of Hiogo; on a large river, on the s.e. coast of the main island, in the most central and populous part of the empire, surrounded by the great tea districts. O. is one of the three imperial cities of Japan, and is a great centre of trade; especially since 1863, when it became possible for foreigners to settle. The town, clean and regularly built, is intersected by numerous streams, spanned by hundreds of wooden and iron bridges. Some of the public buildings are imposing structures, such as the municipal hall and the new mint. The latter is equipped with the finest obtainable apparatus; and of late much foreign machinery has been introduced into O., to the great advancement of its manufactures. Besides very numerous Buddhist and other temples, there are in O. two Christian churches, govt. college, an acad., and 72 public schools. The town is connected by railway with Hiogo and with Kioto (see Kioto), 27 m. further inland. The foreign imports are valued at near $500,000 annually; the exports at $1,000,000. Pop. (1877) 281,119.

OSAGE Indians, *ō-sāj′:* tribe of American Indians belonging to the Dakota family. Marquette found them 1673 on the Missouri river. A portion of the tribe assisted the French in their conflict with the Fox Indians at Detroit 1712. Some of their chiefs visited France 1726; and in the war with the English, for possession of the Mississippi valley, the tribe was allied with the French. About the beginning of the 19th c. there were 2 branches, the Great Osages and the Little Osages, total number about 6,300. They were quarrelsome, dishonest, and indolent. Treaties by which they ceded land to the govt. were made 1808,15,18,22,25, and 39. Another branch of the tribe, the Chanees of the Arkansas, had meanwhile been established. A mission opened by the American Board about 1825 was discontinued 20 years later. A Jesuit mission was established 1846, at the request of a party which had visited France. Many of the tribe perished by war and disease. In the civil war, the Osages aided the Confederacy. They were removed 1872 to a reservation in the Indian Territory bounded n. by Kansas, e. by 96° w. long., and s. and w. by the Arkansas river. It contains about 2,297 sq. m. By authority of the govt., the Soc. of Friends has established schools. Agriculture is pursued to some extent. Quite a sum is received as interest on money obtained from the sale of their original lands. In 1885 the tribe numbered 1,950.

OSAGE′ River: rising in Wabaunsee co., Kan., and known in the upper part of its course as Marais des Cygnes. It follows a tortuous line e.s.e. for about 125 m., when it enters Mo. near Fort Scott. It receives many tributaries, drains a fine agricultural country, and is the third river in size in the state. It joins the Missouri river about 10 m. below Jefferson. During 6 months in the year its lower portion is navigable for about 200 miles.

O'SAGE OR'ANGE (*Maclura aurantiaca*): tree of nat. order *Moraceæ*, native of N. America. It attains a height varying, according to soil and situation, from 20 to 60 ft. It is of the same genus with Fustic (q.v.), and its wood, which is bright yellow, might probably be used for dyeing. The wood is fine-grained and very elastic, and is much used by the N. American Indians for bows. The O. O. has been introduced into Britain as a hedge-plant. Its fruit is about the size of a large orange, has a tuberculated surface of golden color, and is filled internally with radiating, somewhat woody fibres, and with a yellow milky juice, the odor of which is generally disliked, so that the fruit, though not unwholesome, is seldom eaten.

OSBECKIA, n. *ŏz-bĕk'ĭ-a* [after Peter Osbeck, a Swedish clergyman and naturalist]: in *bot.*, a genus of *Lasiandridæ*, natives of Asia, Africa, and the adjacent islands. They are mostly herbs, with racemes of purple or violet flowers. The fruit of *O. Principis* is used in Brazil for dyeing black; the leaves of *O. chinensis* are used for poultices.

OSBORNE, *ŏz'bėrn*, THOMAS O.: born Jersey, O., 1832, Aug. 11. After graduating from the Univ. of Ohio 1854, he studied law in Ind. under Gen. Lewis Wallace, secured admission to the bar, and opened an office in Chicago 1858. At the opening of the civil war, he organized a regt., of which he was elected lieut.col., and was promoted col. He was in the battle of Winchester, served at Charleston harbor 1863, and was with Gen. Butler's expedition up the James river 1864. At the battle of Drury's Bluff, he received a wound which rendered his right arm useless. He rendered brilliant service at the siege of Petersburg and in the capture of Lee's army, in recognition of which he was brevetted brig.gen. vols. and maj.gen. vols. After the war, he practiced law in Chicago till 1874, when he was appointed consul-gen. to the Argentine Republic. He resigned this office 1885.

OSBORNE BEDS, *ŏz'bėrn*, or ST. HEL'EN'S BEDS: series of strata of the Middle Eocene period, in the Isle of Wight. They have been divided into two groups: 1. St. Helen's Sands, consisting of layers of white, green, and yellow sands, interstratified with blue, white, and yellowish clays and marls, with maximum thickness of 50 ft.; 2. Nettlestone Grits, composed of yellow limestone and marl, and a shelly freestone, much used for building, having a maximum thickness of 20 ft. The fossils of the O. B. are species of Paludina and Cypris, and the spirally sculptured spore-cases of Chara. The group is of fresh and brackish water origin, and is very variable in mineral character and in thickness.

OS'CANS, or OP'ICANS: see OSCI.

OSCAR I., *ŏs'kėr*, JOSEPH-FRANCIS, King of Sweden and Norway: 1799, July 4—1859, July 8 (reigned 1844–57); b. Paris; only child by the marriage of Charles XIV. (q.v.), formerly Marshal Bernadotte, with Desirée Clary, daughter of a Marseillais merchant and sister of Madame Joseph Bonaparte. After the election of his father as crown-prince of Sweden, O. received the title Duke of Sudermania, and was placed under the tutelage of the poet Atterbom, to acquire the Swedish language. In 1818 he entered the Univ. of Upsala. He was remarkably proficient in science, literature, and especially the fine arts: he composed various pieces of music, including an opera, waltzes, marches, etc.; he also wrote several songs and hymns, and published memoirs on Education and Penal Establishments. Thoroughly imbued with the national sentiments, after his admission to a share in the administration he opposed, with becoming filial respect, the pro-Russian policy of his father; and his accession to the throne was hailed with delight by his subjects. His rule was distinguished for liberality and justice; and many liberal measures, such as those for the removal of Jewish disabilities, freedom of manufactures and commerce, and parliamentary reform (the last mentioned being vigorously opposed by the nobility), were laid before the *Riksdag* by his orders. He introduced reforms and liberal measures with much vigor, yet with caution and gentleness, and mostly with success. His foreign policy, independent and anti-Russian, gained the general respect of Europe. 1823, July 19, he married Josephine Beauharnais, granddaughter of Empress Josephine, by whom he had five children, the eldest of whom, on account of his father's failing health, was appointed regent 1857, Sep. 25; and at his death succeeded to the throne as Charles XV. Charles XV. died 1872, Sep. 18; and was succeeded by his brother as Oscar II.

OS'CAR II., King of Sweden and Norway (pen-name OSCAR FREDERICK): born Stockholm, 1829, Jan. 21; son of Oscar I. He served in the army, studied at the Univ. of Upsala, and spent considerable time in travel on the continent. He was married 1857, June 6, to Princess Sophia of Nassau; and 1872, Sep. 18, succeeded his brother Charles as king. He has given much attention to internal improvements, added greatly to the efficiency of the army, and reorganized the railroad system. In 1873 he went to Lapland, and two years later visited the emperors of Russia and Germany. He also visited Emperor William II. at Berlin 1888, Aug. He is a fine scholar; has written a sketch of Charles XII., a vol. of poems 1888; and has translated Goethe's *Faust* and *Tasso*. At a meeting of the Orientalists' Congress, Christiania, 1889, Sep. 9–11, he delivered an able address. He has four sons.

OSCEOLA, *ŏs-sē-ō′la* (Seminole, *As-se-ho-lar*): chief of the tribe of Seminole Indians in Fla.: about 1803–1838, Jan.; son of an Eng. trader named Powell and the daughter of a Seminole chief. In 1835 the wife of O., a chief's daughter, was claimed and seized as a slave by the owner of her mother. The outraged husband threatened revenge, and for his threats was imprisoned six days in irons by Gen. Thompson. Lying in wait, a few days afterward he killed the general and four others. This was the beginning of the second Seminole war. Laying an ambush soon afterward, he killed Major Dale and a small detachment of soldiers; and taking to the almost impenetrable Everglades, with two or three hundred followers, he fought for a year with great energy and skill the superior numbers sent against him. He was taken prisoner at last by Gen. Jesup, while holding conference under a flag of truce—an act which has been criticised as treachery, though represented as one of retaliation; and was confined in Fort Moultrie until his death.

O′SCHERSLEBEN, or GROSS-OSCHERSLEBEN, *ġrōs-ō′shĕrs-lā-bĕn:* town of Prussian Saxony, on the left bank of the Bode, a branch of the Saale, 22 m. w.s.w. from Magdeburg. Pop. (1875) 7,927.

O′SCI, or OSCANS (originally OPSCI—rendered, by Mommsen, 'laborers,' from *opus*, a work), in Greek always OPIKOI: an Italian people, who at an early period occupied Campania, and were either closely allied to, or the same race as, the Ausones. Subsequently (about B.C. 423), Samnites from the hilly districts of the n. overran the country, and amalgamated with the inhabitants whom they had subjugated. It is conjectured that the conquerors were few in numbers, as (like the Normans in English history) they adopted in time the language of the conquered; but whether they modified the original Oscan language, and, if so, to what extent, cannot now be ascertained. As it was these Samnitic O. or Campanians who formed that Samnitic people with whom first both the Greeks of lower Italy and the Romans came into contact, the names *Osci* and *Oscan language* were subsequently applied to all the other races and dialects whose origin was nearly or wholly the same. The Oscan language was not substantially different from the Latin, but only a ruder and more primitive form of the same central Italic tongue. The territory where it was spoken comprised the countries of the Samnites, Frentani, northern Apulians, Hirpini, Campani, Lucani, Bruttii, and Mamertini, whose dialects differed only slightly from each other; besides the entire Samnitic races, whence the language is sometimes called Samnitic or Safinic. The races n. of the Silarus were purely Samnitic; those s. of it, and even of the region round the Gulf of Naples, were Græco-Samnitic: the use of the national Samnitic alphabet was confined to the former. By the victories of the Romans over the Samnites, and the conferring of the *civitas* on all the Italians (B.C. 88), an end was put to the official use of the Oscan tongue; nevertheless, in the time of Varro (B.C. 1st c.) it was still used by the people, and as late as the destruction of Herculaneum and Pompeii was spoken by a few individuals. During its most flourishing period, it was something more than a country *patois;* it is even possible that the O. had a literature and art of their own, which may not have been without influence on the early Calabrian poets, Ennius and Pacuvius, and the Campanian Lucilius. At any rate, we certainly know of a poetic creation peculiar to the Campanians, a kind of unwritten, regular, probably improvised farce, with fixed parts and changing situations, transplanted to Rome about B.C. 304, but imitated there not in Oscan, but in Latin: see ATELLANÆ. Besides a considerable number of coins with Oscan legends, there are extant inscriptions in the Oscan tongue, among which the most important for linguistic purposes are, 1st, the *Tabula Bantina*, a bronze tablet found in the neighborhood of Bantia (on the borders of Lucania and Apulia), referring to the municipal affairs of that town; 2d, the *Cippus Abellanus*, or Stone of Abella (in Campania); and 3d, a bronze tablet found near Agnone, in n. Samnium. See Mommsen's *Oskische Studien* (Berlin 1845) and *Die Unteritalischen Dialekte* (Leip. 1850); also Friedländer's *Die Oskischen Münzen* (Leip. 1850), Kirchhoff's *Das Stadtrecht von Bantia* (Berl. 1853), and Donaldson's *Varronianus* (104–138).

OSCILLATE, v. *ŏs′sĭl-āt* [L. *oscillatus*, swung—from *oscil′lum*, a swing: It. *oscillare:* F. *osciller*, to swing]: to move backward and forward; to swing. OS′CILLATING, imp.: ADJ. swinging; vibrating. OS′CILLATED, pp. OS′CILLA′TION, n. *-lā′shŭn*, a swinging like a pendulum. OS′CILLA′TORY, a. *-tėr-ĭ*, vibrating; swinging. OSCILLATING ENGINE, a marine engine with a vibrating cylinder. *Note.—Oscillum*, a swing, may be the same word as *oscillum*, a little image or puppet made to swing or dance —dim. of L. *osculum*, the mouth—see Skeat.

OSCULA, n. plu. *ŏs′kū-lă* [L. *os′cula*, little mouths; *os′culum*, a little mouth, a kiss—from *os*, a mouth]: the name given to the larger pores on the surface of a sponge. OS′CULAR, a. *-lėr*, pertaining to. OS′CULATE, v. *-lāt* [L. *osculātus*, kissed]: to kiss; to come in contact with, as a curve and a circle; to adhere closely, as caterpillars and other creeping animals. OS′CULATING, imp. OSCULATED, pp. OS′CULA′TION, n. *-lā′shŭn*, a kiss; close contact: in *geom.* (see below). OS′CULANT, a. *-lănt*, that adheres closely. OS′CULA′TORY, a. *-lā′tėr-ĭ*, of or pertaining to kissing; having the same curvature at the point of contact: N. a tablet or board having the picture of Christ or the Virgin, which was first kissed by the priest and then by the people. OS′CULE, n. *-kūl*, a small two-lipped aperture.

OSCULA′TION, in Geometry: term denoting the relation of two curves to each other when several points are common to one with the other; the degree of O. being said to be high or low according as the number of points in contact are many or few. The number of possible points of contact is determined by the number of constants contained in the equation to the tangent curve (supposing the number of constants in the equation to the curve which is touched to be greater). The same is true of a straight line and a curve. The equation to a straight line, being of the form $ax + b$, contains two constants, a and b—hence a straight line *can* coincide with a curve in *two* contiguous points, and the contact is said to be of the *first* order. This straight line is the tangent at the point of contact. When a straight line, not a tangent, meets a curve, there is no 'contact,' but 'section,' as in that case only one point is common to the straight line and the curve. The equation to a circle contains three constants, and therefore a circle *can* have *three* consecutive points in common with a curve, and the contact is then of the *second* order. This circle is known as the 'circle of curvature,' or the *osculating circle* (see fig. under title CURVATURE), and has for its radius the radius of curvature of that portion of the curve with which the circle is in contact. No other circle can have so high a degree of contact with a curve at any point as the osculating circle at that point.

OSCULATRIX, n. *ŏs′kū-lā-trĭks:* in *geom.*, a curve which has a higher order of contact with a given curve, at a given point, than any other curve of the same kind.

ÖSEL: see OESEL.

OSGOOD, FRANCES SARGENT: author: 1811, June 18—1850, May 12; b. Boston. She early gained some literary repute, and was editor of the *Ladies' Companion.* In 1835 she married Samuel Stillman Osgood, portrait painter, and went to London, where she wrote for the English magazines. She returned to Boston 1840, and later removed to New York. She wrote many poetical works of a pleasing character.—See her 'Life,' by Rufus W. Griswold.

OSGOOD, *ŏz′gûd*, **HELEN LOUISE (GILSON)**: about 1835–1868, Apr. 20; b. Boston. She was liberally educated, made remarkable progress in music, and was noted for her conversational powers. She was one of the pioneers in the organization of soldiers' aid societies at the opening of the civil war. In the spring of 1862 she became a nurse in the Army of the Potomac, and remained till the close of the war. She possessed remarkable executive ability; was the organizer, and for some time the manager, of a hospital in which 1,000 colored soldiers were cared for. Mr. Osgood, whom she married 1866, had been prominently connected with the Sanitary Commission. She died at Newton Centre, Mass., from disease brought on by overwork in her benevolent and patriotic service.

OSGOOD, Howard, D.D.: Baptist minister: b. 1831, Jan. 4, Plaquemine parish, La. After studying at Harvard he was ordained to the ministry as a Baptist, though brought up an Episcopalian; was pastor at Flushing, N. Y., and in New York; was called 1868 to be prof. of Hebrew in Crozier Theol. Seminary, Penn.; and 1875 to the same chair in Rochester Theol. Seminary. He was one of the American revisers of The Old Testament.

OSGOOD, Kate Putnam: author: b. Fryeburg, Me., 1841; sister of James Ripley O., publisher. After five years of European sojourn, she returned to the United States 1874. She has written frequently in prose and poetry for the magazines—her best-known production being a poem, *Driving Home the Cows*, in *Harper's Magazine*, 1865, Mar., which had immense popularity.

OS'GOOD, Samuel: 1748, Feb. 14—1813, Aug. 12; b. Andover, Mass. He graduated from Harvard 1770, studied theology, but on account of failing health entered mercantile life. He was a col. in the revolutionary army, was in the Mass. legislature, in congress 1780–84, was appointed judge 1785, was first commissioner of the U. S. treasury 1785–89, and postmaster-gen. 1789–91, resigning in the latter year on account of the removal of the seat of govt. to Philadelphia. He had become a resident of New York, became a member of the N. Y. legislature, was supervisor of the state, and for about 10 years previous to his death was naval officer of the port of New York. Among his books were *A Letter on Episcopacy* and *Theology and Metaphysics*. He d. at New York.

OS'GOOD, Samuel, D.D., LL.D.: 1812, Aug. 30—1880, Apr. 14; b. Charlestown, Mass. He graduated from Harvard College 1832, and from the Unit. Divinity School 3 years later. After editing the *Western Messenger* at Louisville, Ky., two years, he became pastor of a Unit. church at Nashua, N. H., 1837; was settled at Providence 1841, and 1849 became pastor of the Church of the Messiah in New York, which office he held 20 years. He travelled in Europe 1869, left the Unit. and joined the Prot. Episc. denomination 1870, and gave the remainder of his life to literary pursuits. He was a corresponding sec. of the New York Historical Soc. for several years, and was a popular lecturer and magazine-writer. During several years of his pastorate in New York, he was one of the editors of the *Christian Inquirer* (Unit.). Besides translating some important German works, he wrote *Studies in Christian Biography*, *God with Man*, *The Hearth-Stone*, *Student-Life*, *American Leaves*, and other books. He d. at New York.

OSHIMA (big island): Japanese term for the larger of two neighboring islands. It is applied especially to Barneveld's or Vries Island, near the entrance to the Gulf of Yedo, 8 m. long 5 m. wide, on which are several villages, a good harbor, and a volcano about 2,500 ft. high.

OSHKOSH, *ŏsh'kŏsh:* city, cap. of Winnebago co., Wis.; on the Fox river, at its junction with Lake Winnebago, and on the Chicago and Northwestern, the Chicago Milwaukee and St. Paul, the Wisconsin Central, and the Milwaukee Lake Shore and Western railroads; 17 m. from Fond du Lac, about 100 m. by rail from Milwaukee. It has direct water-communication with Lake Michigan on the e. and the Mississippi river on the w. It is built on each side of the Fox river, and extends about 4 m. along the lake-front. The site slopes from the water, thus giving natural drainage. There are 25 churches; many benevolent and fraternal societies; a state normal school, high school, excellent public schools of lower grade, and 11 private schools; a public library; 1 monthly, 1 semi-monthly, 6 weekly, and 2 daily newspapers; 3 national banks and 1 state bank (cap. $600,000). There are two opera-houses and 5 hotels. The Northern Wisconsin Insane Asylum, and a hospital under the management of the Alexian Brothers, are located here. There is a line of street railroad; many of the streets are paved, and are lighted with electricity. The stores and residences are largely lighted with gas. There is an efficient fire department. An abundant supply of pure water is obtained from artesian wells, and distributed by the Holly system. The Fox river is crossed by 3 fine iron bridges for wagons and 3 railroad bridges. Among notable public buildings are the court-house, city-hall, Masonic temple, and the U. S. govt. building. The lumber business is of immense proportions, one of the companies engaged therein having the largest plant of the kind in the world. There are more than a dozen large saw-mills, a large number of shingle-mills, several sash and door factories which supply about 10 per cent. of all the goods of these classes made in the United States, numerous planing-mills, 5 carriage factories, several furniture-shops, foundries and machine-shops, 4 chair factories, 2 trunk factories, several pork-packing establishments, 3 soap factories, and the largest match factory in the world. A trading-post was established by the French about 1820, but the first permanent settlement at O. was made by parties from New England 1836. A city charter was secured 1853. The buildings were nearly all burned 1859, and there were very destructive fires 1866, 74, and 75. The suburban portion of the city also suffered severely from a cyclone 1885. Area 9 sq. m.; public debt $116,000; valuation $7,093,837. Pop. (1870) 12,663; (1880) 15,748; (1885) 22,064; (1890) about 28,000.

OSIANDER, *ō-zē-ân'dėr,* ANDREAS: learned and zealous German reformer: 1498, Dec. 19—1552, Oct. 17; b. Gunzenhausen, near Nürnberg. His father was a blacksmith, called Heiligmann, or according to some, Hosemann, out of which name his son, after the fashion of his time, manufactured the classic-looking Osiander. O. was educated at Ingolstadt and Wittenberg; and after completing his course of study, became a preacher at

Nürnberg, where he was conspicuously active in introducing the Reformation (1522). He ardently advocated the views of Luther in his controversy with the Swiss reformer Zwingli, on the question of the Lord's Supper. He took part in the conference held at Marburg (1529), and was present at the diet of Augsburg (1530). In 1548 he was deprived of his office as preacher at Nürnberg, because he would not agree to the Augsburg Interim; but was immediately afterward invited by Albrecht, Duke of Prussia, to become head of the theological faculty in the newly-established univ. of Königsberg. He was hardly settled here when he became entangled in a theological strife that imbittered his naturally imperious, vehement, and arrogant temper. In a treatise, *De Lege et Evangelio* ('On the Law and the Gospel'), O. asserted that the righteousness by which sinners are justified, is not to be conceived as a mere justificatory or imputative act on the part of God, but as something inward and subjective, as the impartation of a real righteousness, springing in a mystical way from the union of Christ with man. The most notable of his opponents was Martin Chemnitz (q.v.). A seemingly amicable arrangement between the disputants was brought about by Duke Albrecht 1551; but the strife was soon recommenced, by O. publishing some new writings in which he attacked Melanchthon; nor did his death in the following year put a stop to the war of words. It was continued by his followers, called *Osiandrists*, who were finally extinguished by the *Corpus Doctrinæ Prutenicum* (1567), which caused their banishment from all parts of Prussia. See Wilken, *Andr. Osiander's Leben, Lehre und Schriften* (Strals. 1844).

OSIER, n. *ō'zhėr* [F. *osier*, a willow: prov. F. *aoza*, to form, to fashion; *aozil*, a willow: Gr. *oisos*, a species of willow]: popular name of those species of Willow (q.v.), used chiefly for basket-making and other wicker-work. OSIERED, a. *ō'zhėrd*, covered with osiers. OSIER-BED, or OSIER-HOLT [AS. *holt*, a grove]: piece of land, especially an islet, on which willows are cultivated for basketwork.—*Osiers* are of low bushy growth, few ever becoming trees; their branches long and slender; and they are the more valuable in proportion to the length, slenderness, suppleness, and toughness of their branches. Their leaves are long and narrow, lanceolate, or nearly so, obscurely notched on the margin, almost always smooth on the upper side, but generally white and downy beneath. The COMMON O. (*Salix viminalis*), a common native of wet alluvial grounds, is one of those which sometimes become trees, though when cultivated for basket-making, it is not permitted to do so. It has two distinct stamens in the flowers of the male catkins; and the stigmas of the female catkins are long and slender. It is often planted to prevent the banks of rivers from being washed away. Its branches are used for making hoops and coarse baskets. There are several varieties in cultivation, not easily distinguished except by a very practiced eye, but much more useful than the original or wild kind, which is apt to break, and therefore of little value. More suitable for finer basket-making are *Salix Forbyana*, sometimes called the FINE BASKET O., and *S. rubra*, known in some places as the GREEN-LEAVED O. or ORNARD; *S. triandra*, triandrous species, known to English osier-cultivators and basket-makers as the SPANIARD ROD; while *S. vitellina*, pentandrous species, sometimes becoming a tree, is the GOLDEN O. or Golden Willow, remarkable for the bright yellow of its branches, as well as for their pliancy and toughness. There are other valuable species; but the osiers chiefly cultivated are of the above species or those very nearly allied to them.

Osiers are very extensively cultivated in Holland, Belgium, and France, on alluvial soils, especially near the mouths of rivers; and from these countries great quantities of 'rods' are exported. Osiers grow particularly well on grounds flooded by the tide. Much depends on the closeness of planting of O. grounds; as when space is too abundant, the shoots of many of the kinds do not grow up so long, slender, and unbranched as is desirable. The French cultivators, when they wish osiers for the finest kinds of basket-work, cut branches into little bits, with a bud or eye in each, and plant these close together, so as to obtain weak but fine shoots; but generally cuttings 15 or 16 inches in length are used, and of moderately thick branches; and these are placed in rows, 18 inches to 2 ft. apart, and at distances of 15 to 18 inches in the row. O. plantations in light soils continue productive 15 or 20 years, and much longer in rich alluvial soils. Osiers thrive in rich soils, but not in clays. No cultivation is required after planting; but the shoots are cut once a year, at any time between the fall of the leaf and the rising of the sap in spring. After cutting, they are sorted; and those intended for brown baskets are carefully dried and stacked, care being taken that they do not *heat*, to which they are liable, like hay, and by which they would be rotted and rendered worthless. The stacks must be carefully protected from rain. The osiers intended for white baskets cannot at once be peeled; but after being sorted, they are placed upright in wide shallow trenches, in which there is water to the depth of about four inches, or in rivulets, being kept secure in their upright position by posts and rails; and thus they remain till they begin to bud and blossom in spring, which they do as if they remained on the parent plant, sending forth small roots at the same time into the water. They are then, in ordinary seasons, easily peeled by drawing them through an instrument called a *break;* but in cold springs it is sometimes necessary to lay them for a while under a quantity of litter. After being peeled, they are stacked, preparatory to sale.

OSIRIS, n. *ŏs-ī′rĭs*, also ASIRIS, or HYSIRIS (Many-eyed): one of the principal Egyptian deities, husband of Isis, and father of Orus; worshipped throughout Egypt under the form of a bull, or of a human body with a bull's head. OSIRIAN, a. *ŏs-ĭr′ĭ-ăn*, of or pertaining to Osiris. OSIR′IANISM, n. *-ĭzm*, the rites and doctrines connected with the worship of Osiris.—*Osiris* appears in the hieroglyphic texts as early as the 4th dynasty, and is expressed by a throne and eye; at a later period, that of the 19th dynasty, a palanquin is substituted for a throne; and under the Romans, the pupil of the eye for the eye itself. O. does not indeed appear to have been universally honored till the time of the 11th and 12th dynasties, or about B.C. 1800, when Abydos, reputed his burial-place, rose into importance. In the monuments of this age he is called great god, eternal ruler, dwelling in the west, and lord of Abut or Abydos. Even at the most remote period, individuals after death were supposed to become an Osiris; and all the prayers and ceremonies performed or addressed to them were in this character, referring to their future life and resurrection. At the time of the 18th dynasty, this title of O. was prefixed to their names, and continued to be so till the time of the Romans and fall of paganism.

In the Ritual, and other inscriptions, O. is said to be son of Seb or Saturn, and born of Nu or Rhea; to be father of Horus by Isis, of Anubis, and of the four genii of the dead. Many mystic notions were connected with O.; he was sometimes thought to be son of Ra the Sun, or of Atum the setting Sun, and the Bennu or Phœnix; also to be uncreate, or self-engendered, and he is identified in some instances with the Sun or the Creator, and the Pluto or Judge of Hades. O. was born on the first of the Epagomenæ, or five additional days of the year. When born, Chronos or Saturn is said to have given him in charge to Pamyles; having become king of Egypt, he is stated to have civilized the Egyptians, and especially to have taught them agriculture, the culture of the vine, and the art of making beer; he afterward travelled over the earth, and conquered the people everywhere by his persuasion. During his absence, his kingdom was confided to Isis, who guarded it strictly; and Set or Typhon, brother of O. (born on the 3d of the Epagomenæ) was unable to revolt against him. Typhon had, however, persuaded 72 other persons, and Aso, queen of Ethiopia, to join him in a conspiracy; and having taken the measure of O., he had a chest made of the same dimensions, richly ornamented and carved, and produced it at a banquet, where he promised to give it to whomsoever it should fit; and when all had lain down and tried it, and it suited none, O. at last laid himself down in it, and was immediately covered over by the conspirators, who placed the lid upon it, and fastened it with nails and molten lead. The chest was then hurled into the Nile, and floated down the Tanaitic mouth into the sea. This happened on the 17th of the month Athyr, in the 28th year of the reign or age of Osiris. Khem or Pan, and his attendant deities, discovered the loss of the god; Isis immediately cut off a lock of hair and went into mourning, and proceeded in search of Anubis, child of her sister Nephthys by O.; and having found him, brought him up. The chest having floated to Byblos, had lodged in a tamarisk, and became inclosed in the tree, which was cut down by the king, and the trunk, containing the chest and the body of the god, converted into a pillar to support the roof of the palace. The goddess proceeded to Byblos, and ingratiated herself with the queen's women by plaiting their hair and imparting to it an ambrosial smell, so that the monarch, whose name was Melcarthus, and his wife, Saosis or Nemanoun, invited her to court to take care of the royal child. She endeavored to confer immortality on him by placing him on a fire, and changing herself into a swallow, flew round the pillar and bemoaned her fate. The queen became alarmed at the danger of her child; Isis revealed herself, and asked for the pillar of tamarisk wood, which was given her. She then cut it open, and took out the chest, making great lamentations, and subsequently sailed for Egypt, with the eldest of the king's sons. The goddess, intending to visit Horus her son at Buto, deposited the chest in an unfrequented spot; but Typhon discovered it by the light of the moon, tore it into 14 pieces, and distributed each to a nome or district. Isis recovered all by passing the marshes in a boat of papyrus; all except the phallus, which had been eaten by the Lepidotus, the Phagrus, and Oxyrhynchus fish. Subsequently, a battle took place between Horus and Typhon or Set, which lasted three days, and ended by Typhon having fetters placed upon him. Isis, however, liberated Typhon, which so enraged Horus that he tore off her diadem, but Teti or Thoth placed on her the head of a cow instead. Typhon finally accused Horus of illegitimacy; but the question was decided between them by Teti or Thoth and the gods. From O., after his death, and Isis sprung Harpocrates: see HARPOCRATES. O. seems to have been finally revived, and to have become the judge of the Karneter or Hades, presiding at the final judgment of souls in the Hall of the two Truths, with the 42 demons who presided over the capital sins, and awarding to the soul its final destiny. Thoth or Hermes recorded the judgment, and justified the deceased against his accusers, as he had done for Osiris.

Considerable diversity of opinion existed among the ancients themselves as to the meaning of the myth of Osiris. He represented, according to Plutarch, the inundation of the Nile; Isis, the irrigated land; Horus, the vapors; Buto, the marshes; Nephthys, the edge of the desert; Anubis, the barren soil; Typhon, was the sea; the conspirators were the drought; the chest was the river's banks. The Tanaitic branch was the one which overflowed unprofitably; the 28 years, the number of cubits which the Nile rose at Elephantine; Harpocrates, the first shootings of the corn. Such are the naturalistic interpretations of Plutarch; but there appears in the myth the dualistic principle of good and evil, represented by O. and Set or Typhon, or paralleled by the contest of Ra or the Son, and Apophis or Darkness. The difficulty of interpretation is increased from the form of O. having become blended or identified with that of other deities, especially Ptah-Socharis, the pigmy of Memphis, and the bull Hapis or Apis, the avatar of Ptah. O. was the head of a tetrad of deities, whose local worship was at Abydos, but who were the last repetition of the gods of the other nomes of Egypt, and who had assumed an heroic or mortal type. In form, O. is always represented swathed or mummied in allusion to his embalmment; a net-work, suggestive of the net by which his remains were fished out of the Nile, covers this dress; on his head he wears the cap *atf*, having at each side the feather of truth, of which he was the lord. This is placed on the horns of a goat. His hands hold the crook and whip, to indicate his governing and directing power; and his feet are based on the cubit of truth; a panther's skin on a pole is often placed before him, and festoons of grapes hang over his shrine, connecting him with Dionysos. As 'the good being,' or Onnophris the meek hearted, the celestial or king of heaven, he wears the white or upper crown. Another and rarer type of him represents him as the *Tat*, or emblem of stability, wearing the crown of the two Truths upon his head. His worship, at a later time, was extended over Asia Minor, Greece, and Rome, and at an early age had penetrated into Phœnicia, traces of it being found on the coins of Malta and other places. It was introduced with the Isiac worship into Rome, and had votaries under the Roman empire. But the attacks of the philosophers, and the rise of Christianity, overthrew these exotic deities, which were never popular with the more cultivated portion of the Roman world.

Herodotus, ii. 40–42; Plutarch, *De Iside;* Tibullus, i. 7; Diodorus, i. 25; Prichard, *Mythology*, 208; Wilkinson, *Man. and Cust.* iv. 314; Bunsen, *Egypt's Place*, i. 414.

OSKALOOSA, *ŏs-ka-lô'sa:* city, cap. of Mahaska co., Io.; on the Chicago Rock Island and Pacific, Central Iowa, and the Burlington and Western railroads; 62 m. s.e. of Des Moines. It is in a coal-mining and stock-raising region. The city contains water-works (cost $175,000), gas and electric light plants, electric street railroad, 5 public high and grammar schools with 35 teachers and 2,000 pupils, board of trade, 2 national banks (cap. $150,000), 1 state bank (cap. $100,000), 1 private bank, 3 colleges and 1 daily, 3 weekly, and 1 monthly publications. In 1889 the investments in business buildings were more than $1,000,000, churches $115,000, colleges and public schools $200,000, and shops and factories $175,000; value of local improvements $200,000. The manufactures comprise gloves, brooms, iron products, stoves, furnaces, steam-heating apparatus, iron bridge work, etc. Pop. (1890) 8,000.

OSMAN′: see OTHMAN.

OSMAZOME, n. *ŏz′mă-zōm* [Gr. *osmē*, odor; *zōmos*, broth, sauce: F. *osmazome*]: name given by Thenard to the spirit-extract of flesh, on which, as he supposed, its agreeable taste, when cooked, depended. The term is now abandoned by chemists.

OSMEROIDES, n. plu. *ŏz′mĕr-oydz* [L. *osmĕrus*, a smelt; Gr. *eidos*, resemblance]: in *geol.*, a genus of fossil fishes found in the Chalk of England—so named from their resemblance to the smelt, small fish of the salmon family.

OSMIC ACID: see under OSMIUM.

OSMIRIDIUM, n. *ŏz′mĭr-ĭd′ĭ-ŭm:* a native compound of *osmium* and *iridium*.

OSMIUM, n. *ŏz′mĭ-ŭm* [Gr. *osmē*, smell, named from the strong irritating odor given out by its tetroxide when at a temperature about 220° Fahr.]: elementary body; one of the noble metals found associated with platinum in the form of an alloy with iridium. OS′MIC ACID, *-mĭk*, or OS′MIOUS ACID, *-mĭ-ŭs*, acids from osmium.—Osmium (symb. Os; old equiv. 100; new eq. 200; spec. grav. 10). It may be obtained in the metallic condition by several processes which yield it either in thin, dark-gray glistening scales, or as a dense iron-black mass. It is the least fusible of all metals; the oxyhydrogen jet volatilizing it, but not fusing it.

Five oxides of O. are known—viz., the *protoxide* (OsO), of dark-green color, and forming green salts when dissolved in acids; the *sesquioxide* (Os_2O_3), a black insoluble powder; the *binoxide* (OsO_2), which is also insoluble and black; the *teroxide* (OsO_3), which possesses the characters of a weak acid radical, but has not been isolated; and *osmic tetroxide* often called *osmic acid* (OsO_4), in colorless, glistening, acicular crystals, freely soluble in water, and very volatile. It produces a permanent black stain upon the skin, and gives a blue precipitate with tincture of galls. O. forms also three chlorides, $OsCl_2$, Os_2Cl_6, and $OsCl_4$. This metal was discovered by Tennant 1803.

OSMOSE, n. *ŏz′mōz*, or OSMOSIS, n. *ŏz-mō′zĭs* [Gr. *ōsmos*, a pushing impulse—from *ōthein*, to push]: the tendency of fluids of different kinds and densities to become diffused through a separating membrane when placed in contact with it; the action produced by this tendency. OSMOTIC, a. *ŏz-mŏt′ĭk*, pertaining to or having the property of osmose.—*Osmose* denotes the tendency to the diffusion above noted, and the action of that tendency; and *Dialysis* denotes the process of analysis of liquid by such diffusion. For the earlier discoveries of Dutrochet and Graham, see DIFFUSION. The subject has been much extended recently, principally by the investigations of Graham; and as the phenomena are exceedingly interesting and important, in their relations to secretion, absorption, and various other organic processes, some of these later facts are here given.

OSMOSE.

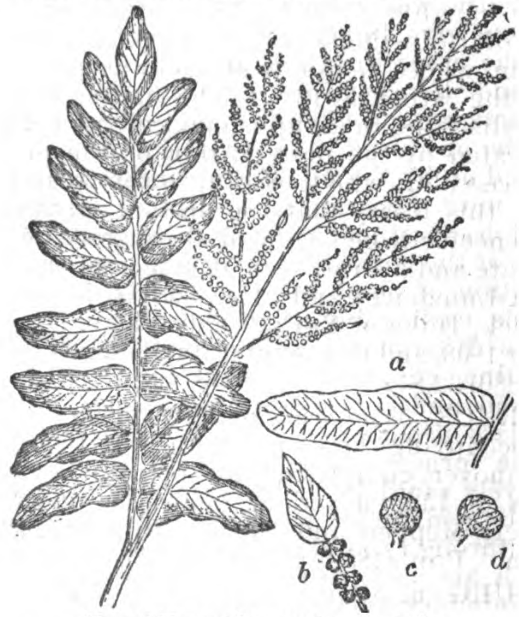
When two different liquids are separated by a bladder or other membrane, or a piece of calico coated with coagulated albumen, there is always a more or less rapid transference of the two liquids in opposite directions through the diaphragm. In certain cases, the explanation given under DIFFUSION (above referred to) is complete, but in others it appears insufficient. Graham has made an extensive series of experiments upon O., where distilled water was on one side of the diaphragm, and various liquids and solutions on the other, and has arrived at many general results, of which the following are the more important. The O. is considered as *positive* when more of the water than of the other liquid passes through the diaphragm. Such substances as gum, gelatine, etc., produce scarcely any effect. Solutions of neutral salts, e.g., common salt, Epsom salts, etc., follow the ordinary law of diffusion, as if no diaphragm had been interposed. Acid salts in solution, and dilute acids, pass rapidly into the water—or the O. is *negative;* while alkaline solutions give, in general, a strong *positive* effect.

In all the cases in which an osmotic action occurs which cannot be explained by capillary forces, there is chemical action on the diaphragm; and conversely, such O. cannot be produced if the material of the diaphragm be not acted on by the liquids in contact with it.

But the most remarkable results of Graham's later investigations are those relating to Dialysis—i.e., to the separation of the constituents of mixtures, and even the decomposition of chemical compounds, by O. The results of his earlier investigations, above given, show remarkable difference between two classes of bodies; gum, gelatine, etc., which forms viscous solutions, on the one hand; and salts, acids, and alkalies, on the other. The first class he has called *Colloids;* the second, *Crystalloids.* The former are extremely sluggish, the latter comparatively rapid in their action. Thus, of common salt and albumen, under precisely similar circumstances, there pass through the diaphragm in a given time quantities which are as 25 to 1 by weight. Hence, if a solution containing both classes of substances be opposed to pure water, the crystalloids will pass rapidly through the diaphragm, and the colloids slowly. This process promises to be of very great value in medical jurisprudence, as, without introducing any new substance (except the diaphragm and distilled water), we have the means of separating from the generally colloidal contents of animal viscera such poisonous crystalloids as white arsenic, vegetable alkaloids, etc., which by the old methods was usually difficult and uncertain. These methods are still in their infancy. One economical application has been shown practicable. When a bladder is filled with the brine of salt beef, and suspended in fresh water, the salt after a time nearly all disappears, and there remains in the bladder a rich extract of meat fit for making soup.—For a brief notice of the speculations which Graham's researches have led him to form as to the nature of *Matter*, see MATTER.

OSMUND, n. *ŏz′mŭnd* [*Osmunda*, a name of Thor, a Teutonic deity]: fern-plant of the genus OSMUN′DA, and order OSMUNDACEÆ, *ŏs′mŭn-dā′sē-ē*, the flowering fern; the royal fern.

OSMUNDA, *ŏz-mŭn′da:* a genus of ferns, distinguished by spore-cases in branched, stalked masses. The OSMUND-ROYAL, ROYAL or FLOWERING FERN (*O. regalis*), noblest and most striking of British ferns, frequent in moist districts of Scotland and Ireland, growing in boggy places and the wet margins of woods, is found in many parts of Europe and in N. America. It has bipinnate fronds, and panicled spore-cases upon altered fronds, which appear as stalks distinct from the fronds, and assimilate the general appearance to that of a phanerogamous plant. It sometimes rises to 11 ft. in height. It possesses tonic and styptic properties, and its rootstocks were formerly employed in scrofula. The rootstocks abound in a mucilaginous substance, which, being extracted by boiling them in water, is used in n. Europe instead of starch.



Royal Fern (*Osmunda regalis*):
a, pinnate of a barren frond; *b*, branchlet of fertile frond; *c*, spore-case; *d*, the same, showing how it opens by two valves.

OS′NABRÜCK: chief town in the territory of O., in the midst of the extended and fruitful valley of the Hase, 80 m. w. s. w. of Hanover by railway. It still ranks as one of the principal commercial cities of Hanover, though it has not the pre-eminence which it had before the establishment of the Zollverein. O. has thriving manufactories of cigars and tobacco, paper-hangings, and cotton and woolen goods, and extensive works for preparation of mineral dyes and cement, besides iron, machinery, and carriage manufactories. According to the opinion of antiquarians, O. stands on the site of the anc. Wittekindsburg, which was raised to a bishopric 783 by Charlemagne, some relics of whom, together with the pretended bones of the martyrs Crispinus and Crispinianus, are preserved in the cathedral—a fine specimen of the Byzantine architecture of the 12th c. The Church of St. Mary, a noble Gothic building, was erected by the burghers of O. in the 14th c. during their contentions with their haughty ecclesiastical rulers, and contains the grave of Julius Möser (1720–94), patriot and philanthropist, in whose honor a statue was placed in the square of the cathedral 1836. The signing of the peace of Westphalia 1648, in an apartment of the town-hall, is commemorated by the preservation of the portraits of all the ambassadors who took part in the treaty. It was decreed in this treaty that the ancient bishopric of O. should thenceforth be occupied alternately by a Roman Cath. prelate and a Prot. secular prince of the House of Brunswick-Luneburg; and after having been last held by Frederick, Duke of York, the district of O. was ceded to Hanover 1803, and the chapter finally dissolved.—Pop. of town (1880) 32,812.

OSNABRÜCK, *ŏs′nâ-brük*, or OSNABURG, *ŏs′nâ-bûrch:* territory occupying the w. portion of the Prussian province of Hanover, comprising the principality of O., the countships of Lingen and of Bentheim, and the duchy of Arensberg-Meppen and the lordship of Papenburg; 2,408 sq. m. Pop. (1880) about 290,135.

OSNABURG, n. *ŏz′nă-bėrg:* a coarse linen, so called from its being originally imported from *Osnaburg*, in Germany.

OSPREY, n., or OSPRAY, n., *ŏs′prā* [a corruption of *ossifrage*—from L. *ossif′răgus*, the bone-breaker, the sea-eagle—from *os*, a bone—gen. *ossis; frango*, I break], (*Pandion*): genus of *Falconidæ*, of which only one species is known (*P. haliaëtus*), called also the FISHING HAWK or FISHING EAGLE, and the BALD BUZZARD. It is singular among the *Falconidæ* in preying *exclusively* on fish; and to this its whole structure and habits are adapted. Its whole length is about 22 inches: it is of dark-brown color, variegated with black, gray, and white. The under parts are white, except a light-brown band across the chest. The bill is short, strong, rounded, and broad. The tail is rather long, the wings are very long, extending beyond the tail; the under surface of the toes remarkably rough, covered with small pointed scales, suited for securing of slippery prey; the claws not grooved beneath, as in most of the *Falconidæ*. The feathers are destitute of the supplementary plume, which is considerably developed in most of the *Falconidæ*. The intestine differs from that of the other *Falconidæ* in being very slender and of great length. The O. is seen chiefly near the sea, lakes, and large rivers. No bird is more widely diffused; it is found in all quarters of the world, in both very warm and very cold climates. It is everywhere a bird of passage, retiring from high n. latitudes on the appearance of frost. In some places in Scotland, it still breeds year after year, on the highest summit of a ruined building, or the top of an old tree. It is very plentiful in parts of N. America; and its return in the beginning of spring is hailed by fishermen, as indicative of the appearance of fish. The nest is a huge structure of rotten sticks, in the outer interstices of which smaller birds sometimes make their nests; for the O. never preys on birds, and is not dreaded by them. It is, indeed, pacific and timorous, and readily abandons its prey to the White-headed Eagle (or Erne, q.v.). In the days of falconry, the O., being very docile, was sometimes trained and used for catching fish.

Osprey (*Pandion haliaëtus*).

OSSA, *ŏs′sâ:* ancient name of a mountain on the e. side of Thessaly, near Pelion, separated from Olympus by the vale of Tempe. It is now called Kissavo. The conical summit is covered with snow during the greater part of the year. The ancients placed the seat of the centaurs and giants in the neighborhood of Pelion and Ossa.

OSSEIN, or OSSEINE, n. *ŏs′sĕ-ĭn* [L. *ossĕus*, belonging to bone—from *os*, a bone]: bone-cartilage, as extracted from bone, a substance closely resembling gelatine, into which it is converted by continuous boiling. It is obtained by the prolonged action of dilute hydrochloric acid on bone, which dissolves all the earthy matter. The material thus procured retains the form of the bone without its hardness, and must be repeatedly washed with water, and treated with alcohol and ether to remove traces of salts, fat, etc. It is insoluble in water, but is converted into gluten (one of the forms of gelatine) by the action of boiling water—which transformation is much facilitated if a little acid be present. The O. yielded by different kinds of animals requires different times for its conversion into gluten; and that of young animals changes more rapidly than that of adults of the same species. It appears to exist in the bones in a state of freedom—that is to say, not in combination with any of the salts of lime. Fremy's analyses show that the amount of gluten is precisely the same as that of the O. which yields it, and that the two substances are isomeric.

OSSELET, n. *ŏs′sĕ-lĕt* [F. *osselet*, a small bone—from L. *os*, a bone]: a hard substance found growing between the small bones of a horse's knee; an ossicle.

OSSEOUS, a. *ŏs′sĕ-ŭs* [L. *ossĕus*, belonging to a bone—from *os*, a bone—gen. *ossis*: It. *osseo*, osseous]: composed of or resembling bone; bony. OSSEOUS BRECCIA, *brĕk′shĭ-ă*, bones, and fragments of bones, cemented together by calcareous or other matter, found in caverns or fissures.

OSSETER, n. *ŏs′sĕ-tėr* [Russ. *osetr*, a sturgeon]: a species of sturgeon, said to yield one of the best kinds of Russian isinglass.

OSSIAN, *ŏsh′an* or *ŏsh′ĭ-an*, POEMS OF: poetic writings set forth as those of Ossian, or Oisin (a word interpreted the 'little fawn'). Ossian was a Celtic warrior poet, said to have lived in the 3rd c., and to have been the son of Fingal or Finn MacCumhaill. The poems ascribed to him in MSS. of any antiquity, are few and short, and of no remarkable merit. But in 1760–63, a Highland schoolmaster, James Macpherson (q.v.), published two epics, *Fingal* and *Temora*, and several smaller pieces and fragments, which he affirmed to be translations into English prose of Gaelic poems written by O., and preserved by oral tradition in the Scottish Highlands. Their success was wonderful. They were received with admiration in almost every country of Europe, and were translated into French, Italian, Danish, and Polish. But their authenticity was challenged almost as soon as they saw the light, and a long and angry controversy followed. That they were what they claimed to be, was maintained by Dr. Blair, Lord Kames, the poet Gray, and Sir John Sinclair. That they were more or less the fabrication of Macpherson, was maintained by

Dr. Johnson, David Hume, Malcolm Laing, and John Pinkerton. While this controversy still raged, another sprang up scarcely less angry or protracted. Macpherson made O. a Scotch Highlander, but the Irish claimed him as an Irishman. The fact is he was both: for in those early times, n. e. Ireland and the w. coast of Scotland were practically one country; the people spoke one language, they were of one blood; and the narrow strip of sea that divided them served not as a wall of separation, but rather for easy communication by boats. As to the real authorship of the poems, as the original MSS. used by Macpherson have never been produced, there will always remain doubts; it is certain that he did use materials of the same nature as the Ossianic traditions that may be picked up from the mouth of the people in many parts of Ireland and the Highlands at the present day; but how far under Macpherson's hands they were remodelled remains a secret. The contribution to this question made by J. F. Campbell in *Leabhar na Feinne*—digest of all the Ossianic ballads either published by others or collected by Campbell—has tended somewhat to clear up the matter. No trace of Macpherson's two large poems has been recovered. On one point all Gaelic scholars seem agreed—that Macpherson did not, and could not have written the Gaelic (see Encyc. Brit., 9th ed. 'CELTIC LITERATURE'). Poems ascribed to O., committed to writing in the Highlands in the first half of the 16th c., are printed in the *Dean of Lismore's Book* (Edin. 1862), with translations into English and into modern Gaelic. The poems ascribed to O., preserved in Ireland, were pub. by the Ossianic Soc. in six vol. (Dublin 1854–61). Students of the Ossianic poems will find much assistance from consulting the ed. of the Gaelic with a new translation by Dr. Clerk of Kilmallie (Edin. 1870). In 1876 the O. controversy was again agitated, but came to nothing.—See GAELIC (Language and Literature).

OSSICLE, n. *ŏs'sĭ-kl* [L. *ossic'ulum*, a small bone—from *os*, a bone—gen. *ossis*]: a little bone—applied to various small bones in the skeleton; a term applied to the bony points and segments of star-fishes, encrinites, and similar animals. OSSICULA, n. plu. *ŏs-sĭk'ū-lă*, or OSSICLES, n. plu. *ŏs'sĭ-klz* [L. *ossicula*, small bone]: any hard structures of small size, such as the calcareous plates in the integument of the star-fishes, or the small bones of the ear.

OSSIFEROUS, a. *ŏs-sĭf'ėr-ŭs* [L. *os*, a bone—gen. *ossis; fero*, I produce]: producing bone; containing or furnishing bone.

OSSIFIC, OSSIFICATION: see under OSSIFY.

OSSIFRAGE, n. *ŏs'sĭ-frāj* [L. *ossĭfrăgus*, the sea-eagle—from *os*, a bone; *frango*, I break: It. *ossifrago*]: the osprey or sea-eagle: see OSPREY.

OSSIFY, v. *ŏs′sĭ-fī* [F. *ossifier*—from L. *ossĭficārĕ*—from L. *os*, a bone—gen. *ossis; fīō*, I am made]: to convert into bone or a bone-like substance; to become bone. **Os′sifying**, imp.: Adj. becoming bone; bone-forming. **Os′sified**, pp. *-fīd:* Adj. converted into bone or a substance resembling it. **Ossific**, a. *ŏs-sĭf′ĭk*, having power to ossify. **Ossification**, n. *ŏs′sĭ-fĭ-kā′shŭn* [F.—L.]: changing of any soft solid part of an animal body into bone or bony-like matter. The formation of bone, is a process to which physiologists have given much attention, but regarding which there is still considerable difference of opinion. On one point, however, there is general agreement—viz., that the bones are not in any instance a primary formation, but always result from the transformation and earthy impregnation of some pre-existing tissue, most frequently either cartilage or a membrane containing cell-nuclei. At a very early period of embryonic life, as soon, indeed, as any structural differences can be detected, the material from which the bones are to be formed becomes mapped out as a soft gelatinous substance, distinguished from the other tissues by being rather less transparent, and soon becoming decidedly opaque. From this beginning the bones are formed in two ways: either the tissue just described becomes converted into cartilage, afterward replaced by bone, or a germinal membrane is formed in which the ossifying process takes place. The latter is the most simple and rapid mode of forming bone. When ossification commences, the membrane becomes more opaque, and exhibits a decided fibrous character, the fibres being arranged more or less in a reticulated manner. These fibres become more distinct and granular from impregnation with lime salts, and are converted into incipient bone, while the cells scattered among them shoot out into the bone corpuscles, from which the canaliculi are extended probably by resorption. The facial and cranial bones, except those at the base of the skull, are thus formed without intervention of any cartilage.

The process of ossification in Cartilage (q.v.) is too complex and difficult to be presented here. Some physiologists hold that when ossification is carried on in cartilage, a complete molecular replacement of one substance by the other takes place; while others believe that more or less of the cartilaginous matrix remains, and becomes impregnated with earthy matter, at the same time that gluten is substituted for chondrin (chondrin being the variety of gelatine yielded by ossein or bone-cartilage before ossification, and gluten being the variety yielded after that process is established). All the bones of the body, except those of the head and face above mentioned, are at first formed, in part at least, from cartilage.

The time at which ossification commences does not at all follow the order in which the primordial cartilage is laid down. Thus the cartilage of the vertebræ appears before there is any trace of that of the clavicle, yet at birth the ossification of the latter is almost complete, while that of the former is very imperfect for many years. The process of ossification as it occurs in the human femur or thigh-bone, is the following. Ossification begins in the interior of the cartilage at determinate points, hence termed *points* or *centres of ossification:* from these the process advances into the surrounding substance. In the second month of fetal life, one of these centres shows itself about the middle of the shaft, and from this point ossification radidly extends upward and downward along the whole length of the shaft. The upper and lower ends remain cartilaginous, and it is not till the last month of fetal life that a second centre appears at the lower end. The third centre, from which the upper end of the bone is ossified, does not appear till about a year after birth. The bone now consists of two extremities or *epiphyses*, with an intermediate shaft or *diaphysis;* and the superior epiphysis is not ossified to the shaft until about the 18th, and the inferior until after the 20th year. At about the 5th year, a fourth ossific centre is developed in the cartilage of the greater trochanter, and a fifth centre appears in the lesser trochanter at about the 14th year. These osseous processes, thus developed from special ossific centres, are termed *apophyses.* Most of the long bones are developed in a corresponding way. It is a curious fact (so general that it may be regarded as a law) that in the skeletons both of man and of the lower animals, the union of the various apophyses to the epiphyses, and of the epiphyses to the diaphysis or shaft, takes place in the inverse order to that in which their ossification began. The advantages derived from this subdivision of the long bones into segments, with interposed cartilaginous plates, are obvious. Besides the greater facilities for growth thus afforded, the flexibility of the bony framework is thereby greatly increased, and its escape from injury during the many falls incidental to this period of life is in no small degree attributable to this cause. See Humphry *On the Human Skeleton*, 33–45.

True Ossification sometimes occurs as a morbid process; but in many cases, the term is incorrectly used (especially in the case of blood-vessels) to designate a hard calcareous deposit, in which the characteristic microscopic appearances of true bone are altogether absent.

In one sense, the osseous tissue formed in regeneration of destroyed or fractured bones, may be regarded as due to a morbid, though a restorative action. Hypertrophy of bone is not rare; being sometimes local, forming a protuberance on the external surface, in which case it is termed an *exostosis;* and sometimes extending over the whole bone or over several bones, giving rise to the condition known as *hyperostosis.* Again, true osseous tissue occurs sometimes in parts in which, in the normal condition, no bone existed; e.g., in the dura mater, in the so-called permanent cartilages (as those of the larynx, ribs, etc.), in the tendons of certain muscles, and in certain tumors. The peculiar causes of the osseous formations unconnected with bone, are not known.

Calcareous deposits or concretions not exhibiting the microscopical character of bone, but often falsely termed ossifications, are frequent. Analyses of such concretions occurring in pus, in the valves of the heart, in the muscles, and in the lungs, are given by Vogel in his *Pathological Anatomy of the Human Body;* and in some of these concretions, the phosphate and carbonate of lime occur in nearly the same percentages as those in which they are found in bone. The diseased condition usually but incorrectly called ossification of the arteries, is of sufficient importance to require notice. In consequence of the deposition of earthy or calcareous matter in the middle coat of the artery, the vessel loses all its elasticity, and becomes a rigid, unyielding tube. All parts of the arterial system are liable to this change; but it is more frequent in the ascending portion and arch of the aorta, than in any other part of that vessel, and is more frequent in the lower extremities than the upper. The affection is usually partial, but occasionally appears almost universal. Thus, Dr. Adams has recorded a case, in the Dublin Hospital Reports, in which no pulsation could be felt in any part of the body, and even the heart offered no other sign of action than a slight undulating sound. Old age strongly predisposes to this diseased condition, and probably few very aged persons are altogether exempt from it. There is reason to believe that gout and rheumatism also favor these calcareous deposits. This condition of the arteries may give rise to aneurism, to gangrene of the extremities in aged persons, and to atrophy, and consequent feebleness of the brain and heart. (The coronary arteries, which supply the heart with the arterial blood necessary for its own nutrition, are very often, though not always, ossified in angina pectoris.) Moreover, this condition of the vessels materially increases the risk from severe accidents and surgical operations.

OSSIVOROUS, a. *ŏs-sĭv'ō-rŭs* [L. *os*, a bone—gen. *ossis; voro*, I devour]: bone-eating.

OS'SOLI, MARGARET, Marchioness: see **FULLER, MARGARET.**

OSSUARY, n. *ŏs'ū-ėr-ĭ* [L. *osseus*, bony—from *os*, a bone]: a place where the bones of the dead are deposited; a charnel-house.

OSTADE, *os'tâ-dėh*, ADRIAN VAN: painter and engraver of the Dutch school: 1610, Dec. 10—1685, Apr. 27; b. Haarlem. His teachers were Franz Hals and Rembrandt. He followed his art at Haarlem, till the French army of Louis XIV. threatened Holland, when he removed to Amsterdam, where he spent the remainder of his life. Country dancing-greens, farm-yards, stables, interiors of rustic hovels and beer-shops, are the places which he loves to paint; and his persons mostly are coarse peasant carls, men drinking and smoking, or peasant women employed in country work. In everything he did there is bright and vivid naturalness. Not equal to Teniers in originality and quiet humor, he surpasses him in force and fineness of execution, though he is not free from triviality and repetitions, and inaccuracies in drawing. He was a prolific painter, and his works are in very many of the museums and collections of the Netherlands, Germany, France, and England. They have been well engraved by Vischer, Suyderoef, and himself. —Isaac van O., bro. of Adrian; also a painter; 1621-49; b. Haarlem, died Amsterdam. He labored to imitate his bro. in choice of subjects and in style; but later he cultivated a style of his own. With many blemishes, he shows masterly contrasts of light and shade, and fine figure painting, especially in his winter scenes.

OSTASHKOFF, *ŏs-tâsh-kŏf′:* manufacturing district town of Great Russia, govt. of Tver, on the s.e. shore of Lake Seliguer; lat. 57° 10′ n., long. 33° 6′ e. The first settlements on this site are said to have taken place 1230. Pop. (1880) 12,000. Skin-dressing, boot-making, and fishing in the neighboring lakes are principal employments. The woods in the vicinity furnish bark for tanning purposes, and charcoal for the blacksmiths' shops. There are in O. about 40 tanyards, in which skins are dressed, and Russian leather prepared to the amount of $450,000 annually. The leather prepared at Savine's tanyard is known in England, Austria. Italy, and N. America. 280,000 pairs of boots are made annually, and 400 men and 1,000 women are engaged in the manufacture. Manufactures of hatchets and scythes also are carried on. The commerce of O. is small, however, owing to its distance from important lines of communication.

OSTEAL, a. *ŏs′tĕ-ăl* [Gr. *ostĕŏn*, a bone]: belonging to bone. Osteine, n. *ŏs′tĕ-ĭn*, osseous substance or bony tissue. Ostitis, n. *ŏs-tī′tĭs*, the inflammation of bone.

OSTENDE, *ŏs-tĕnd′*, F. *os-tŏngd′:* strongly fortified town of the Belgian province of W. Flanders, on the German Ocean, at the opening of the Ostende and Bruges canal, and on the state railway. Notwithstanding its proximity to the sea, the shallowness of the harbor prevents large ships from entering the port except at high tide. It ranks, however, as the second seaport of the kingdom, Antwerp being the first, and is fortified with walls and broad ditches. It has some good manufactories for linens, sailcloths, and tobacco, and several sugar, salt, and candle works. From its position as a station for the steamers plying daily between London, Dover, and the continent, and as the terminus of various branches of railway in connection with the great French and German lines, it is an active place of transport traffic, and is resorted to in the summer as a bathing-place by 12,000 persons from all parts of the continent. It is, moreover, an important station for oyster, cod, and herring fishing; has a good naval school, some ship-yards, an efficient staff of pilots, and is the seat of a commercial tribunal and a chamber of customs. Its imports 1873 amounted to about $3,500,000; exports nearly $3,000,000. The harbor is furnished with a light-house, and provided with an admirably-constructed stone promenade for accomodation of the public. O. is memorable for the protracted siege which it underwent 1601–04, terminating in the surrender of the Dutch and Flemish garrison to the Spanish commander, Spinola. Pop. (1881) 19,696.

OSTENSIBLE, a. *ŏs-tĕn′sĭ-bl* [F. and Sp. *ostensible;* It. *ostensibile*, ostensible—from L. *ostensus* or *ostentus*, shown, exposed to view]: declared; manifest; apparent; held forth or avowed, but opposed to *real;* plausible. OSTEN′SIBLY, ad. *-blĭ.* OSTENSIBILITY, n. *ŏs-tĕn′sĭ-bĭl′ĭ-tĭ*, the quality or state of being ostensible. OSTEN′SIVE, a. *-sĭv*, showing; betokening; indirect. OSTEN′SIVELY, ad. *-lĭ.*

OSTENSION, n. *ŏs-tĕn′shŭn* [L. *ostensio*, a showing]: the exposition or exhibiting of the sacrament of the Eucharist.

OSTEN′SORY: see MONSTRANCE.

OSTENT, n. *ŏs-tĕnt′* [L. *ostentus*, exposed to view]: in *OE.*, appearance; manner; show; a token; portent.

OSTENTATION, n. *ŏs′tĕn-tā′shŭn* [F. *ostentation*—from L. *ostentātĭōnem*, a showing, a display—from *ostendo*, I show or exhibit]: outward show or appearance; ambitious display; parade; pompous vaunting. OS′TENTA′TIOUS, ad. *-shŭs*, fond of self-display; boastful; showy. OS′TENTA′TIOUSLY, ad. *-shŭs-lĭ.* OS′TENTA′TIOUSNESS, n. *-nĕs*, the state or quality of being ostentatious; vain display.—SYN. of 'ostentation': boasting; boast; parade; pageantry; show; pomp; pompousness; appearance.

OSTEO-, prefix, *ŏs-tē-ō* [Gr. *osteon*, a bone]: formed of bone; bony; resembling bone.

OSTEOBLASTS, n. plu. *ŏs′tĕ-ō-blăsts* [Gr. *ŏstĕŏn*, a bone; *blastos*, a bud, a sprout]: the granular corpuscles or cells which cover in a dense layer the osteogenetic substance, and lie in its meshes, constituting the formative elements of bone.

OSTEOCLASTS, n. plu. *ŏs′tĕ-ō-klăsts* [Gr. *ostĕŏn*, bone; *klastos*, broken, fractured]: large compound or giant cells formed in the absorption of bone, and believed to be essential agents in the process of such absorption.

OSTEOCOLLA, *ŏs-tē-ō-kŏl′la:* kind of size or glue made by removing the mineral matter from bones, and dissolving the gelatine: its common name is bone-glue.

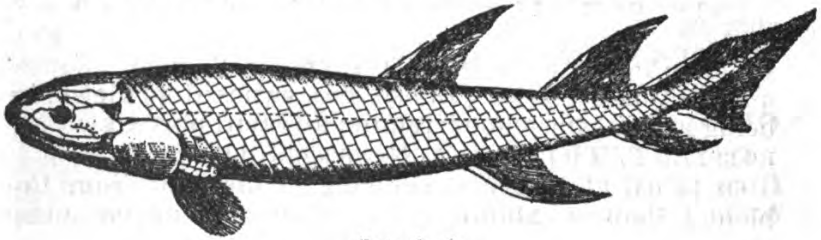
OSTEODENTINE, n. *ŏs′tĕ-ō-dĕn′tĭn* [Gr. *ostĕŏn*, a bone; L. *dens* or *dentem*, a tooth]: the substance forming the teeth of vertebrate animals, and covered by the enamel; a substance intermediate in structure between dentine and bone.

OSTEOGEN, n. *ŏs'tĕ-ō-jĕn* [Gr. *ostĕŏn*, a bone; *gennăō*, I produce]: the soft transparent matter in bone which becomes changed into bony tissue. OSTEOGENETIC, a. *ŏs'tĕ-ō-jĕn-ĕt'ĭk*, denoting the soft transparent substance in bone which becomes ossified. OSTEOGENY, n. *ŏs'tĕ-ŏj'-ĕn-ĭ*, or OSTEOGENESIS, n. *ŏs'tĕ-ō-jĕn'ĕs-ĭs* [Gr. *genĕsis*, origin, source]: the formation or growth of bone.

OSTEOGRAPHY, n. *ŏs'tĕ-ŏg'ră-fĭ* [Gr. *ostĕŏn*, a bone; *graphō*, I write]: a scientific description of the bones. OS'TEOG'RAPHER, n. *-ră-fėr*, an anatomist of the bony parts of the body.

OSTEOID, a. *ŏs'tĕ-oyd* [Gr. *ostĕŏn*, a bone; *eidos*, resemblance]: like or resembling bone; denoting a class of tumors growing from bone, which themselves contain bone.

OSTEOLEPIS, n. *ŏs'tē-ŏl'ĕ-pĭs* [Gr. *ostĕŏn*, a bone; *lepis*, a scale]: genus of fossil ganoid fish peculiar to the Old Red Sandstone; named from the enamelled bony appearance of the scales. It is separated from its allies by having the two anal and two dorsal fins alternating with each other. Seven species have been described.



Osteolepis.

OSTEOLITE, n. *ŏs'tĕ-ō-līt* [Gr. *ostĕŏn*, a bone; *lithos*, a stone]: an earthy phosphate of lime, containing, in nearly a pure state, tricalcic diphosphate.

OSTEOLOGY, n. *ŏs'tĕ-ŏl'ŏ-jĭ* [Gr. *ostĕŏn*, a bone; *logos*, discourse]: department of anatomy which treats of the chemical and physical properties of the osseous tissue, and of the shape, development and growth, articulations, etc., of the various bones of which the skeleton is composed; comparative anatomy: see BONE: OSSIFICATION: SKELETON: ETC. OS'TEOLOG'ICAL, a. *-lŏj'ĭ-kăl*, pertaining to a description of the bones. OS'TEOL'OGER, n. *-ŏl'ŏ-jėr*, or OS'TEOL'OGIST, n. *-jĭst*, one versed in osteology. OS'TEOLOG'ICALLY, ad. *-lĭ*.

OSTEOMA, n. *ŏs'tĕ-ō mă* [Gr. *ostĕŏn*, a bone]: an adventitious growth, consisting of a purely bony mass, set upon a bone, forming with it an organic whole; an exostosis.

OSTEOMALAKIA, or OSTEOMALACIA, n. *ŏs'tĕ-ō-mă-lā'kĭ-ă* [Gr. *ostĕŏn*, bone; *malăkos*, soft]: a diseased softening of the bones in adults: see MOLLITIES OSTEUM.

OSTEOMYELITIS, n. *ŏs′tĕ-ō-mī′ĕl-ī′tĭs* [Gr. *ostĕŏn*, bone; *mŭĕlos*, marrow]: inflammation of the red osseous medulla, and of the pulp contained in the cancelli of spongy bone: often resulting from injuries which expose the medullary canal to the atmosphere or to mechanical injury. Its indications are—after a bone has been injured or surgically operated on—great tenderness, with swelling, abscess, and dark offensive suppuration. It tends to pass into pyæmia, and is very dangerous.

OSTEOPHYTE, n. *ŏs′tĕ-ŏ-fīt* [Gr. *ostĕŏn*, bone; *phŭtŏs*, planted, grown—from *phŭō*, I produce]: a term denoting a great variety of bony growths which are formed, for the most part, in an inflammatory exudation; 'exostoses' may be regarded as outgrowths from bone, while 'osteophytes' seem only to be produced under the influence of a bone, often resulting, e.g., from ossification of the exudation derived from the adjacent hyperæmic vessels.

OSTEOPOROSIS, n. *ŏs′tĕ-ō-pō-rō′sĭs* [Gr. *ostĕŏn*, bone; *pōrŏs*, a callosity]: a diseased state of bone which prevents an increase of size of the bone-cells, and a consequent diminution of density, the surface of the bone being at the same time irregular and porous. OSTEOPOROTIC, a. *ŏs′tĕ-ō-pō-rŏt′ĭk*, of or pertaining to.

OSTERHAUS, *ŏs′tėr-howss*, PETER JOSEPH: born Coblentz, Prussia, about 1820. After serving for some time as an officer in the Prussian army he came to the United States and settled in the vicinity of St. Louis. At the opening of the civil war he entered the Union army as maj. of the 2nd regt., Mo. vols. He was in the battles of Dug Springs and Wilson's Creek, led a brigade under Gen. Fremont and was with Gen. Curtis in his pursuit of Gen. Price in Ark. He led a division of the 13th corps at the capture of Arkansas Post and at the siege of Vicksburg, and a division of the 15th corps at Chattanooga and Missionary Ridge, and commanded the 15th corps in the Atlanta and Carolina campaigns. He was chief of staff to Gen. Canby, and received the surrender of Gen. E. Kirby Smith. He had been promoted col., brig.gen., and maj.gen. vols.; was mustered out of the service 1866, Jan. 15; and was soon afterward appointed U. S. consul at Lyons, France. He removed to Germany, and 1888 was an officer in a manufacturing concern.

OSTERODE, *ōs-tėh-rō′dėh:* small town of Hanover, principality of Grubenhagen, at the w. base of the Harz Mountains, on the Söse, affluent of the Leine, 20 m. n.e. of Göttingen. It contains large grain stores, from which the miners of the neighborhood and their families are supplied with grain at a low and fixed rate. Cotton, woolen, and linen fabrics and hosiery are extensively manufactured, also lead and copper. Pop. (1880) 6,087.

OSTIA, *ŏs′tĭ-â:* city of anc. Latium, at the mouth of the Tiber (whence its name), about 16 m. from Rome. It is said to have been founded by Ancus Martius, and was regarded as the oldest Roman colony. It acquired importance first from its salt-works, the establishment of which is attributed to Ancus Martius; afterward as the port where the Sicilian, Sardinian, and African corn shipped for Rome was landed; yet its name occurs first during the second Punic war. It was long the principal station of the Roman navy; but its harbor was exceedingly bad, and gradually the entrance became silted up with alluvial deposits, so that vessels could no longer approach it, but were compelled to ride at anchor in the open roadstead, and to disembark their cargoes there. At length Emperor Claudius dug a new harbor or basin two m. n. of O., and connected it with the Tiber by a canal. It was named the *Portus Augusti*, and around it soon sprang up a new town called *Portus Ostiensis*, *Portus Urbis*, *Portus Romæ*, and often simply *Portus*. Yet it was not till nearly the close of the Roman empire that the prosperity of O. as a city began to decline. Its decay, however, was rapid, and in the 8th c. it was a mere ruin. During the middle ages, a village—the modern O.—was built about half a mile above the ancient one; but it has not more than 100 permanent inhabitants, who still carry on the manufacture of salt, established in the pre-historic times of ancient Rome. The ruins of O. extend a mile and a half along the banks of the Tiber, and are nearly a mile in breadth.

OSTIARY, n. *ŏs′tĭ-ă-rĭ* [L. *ostĭārĭus*, a door-keeper—from *ostĭum*, a door or entrance]: the mouth or opening by which a river discharges its waters into a sea or lake.

OSTIOLE, n. *ŏs′tĭ-ōl* [L. *ostĭŏlum*, a little door—from *ostĭŭm*, an entrance]: in *bot.*, a longitudinal opening or mouth formed by two crescent-shaped cells. OSTIOLUM, n. *ŏs′tĭ-ŏ-lŭm*, in *bot.*, the orifice through which spores are discharged; the mouth of a perithecium.

OSTITIS, n. *ŏs-tī′tĭs* [Gr. *ostĕŏn*, bone]: a form of bone inflammation, which in its second stage passes on to hardening or sclerosis, or else to suppuration.

OST′LER: see HOST′LER.

OSTMEN, n. plu. *ŏst′mĕn:* Eastmen—the Danish settlers in Ireland being so called.

OSTRACEOUS, a. *ŏs-trā′shŭs* [L. *ostrĕă*, an oyster or mussel]: pertaining to animals of the oyster family, called OSTRACEA, n. plu. *ŏs-trā′shĭ-ă*, or OSTRA′CEANS, *-shĭ-ănz.*

OSTRACION, *ŏs-trā'shĭ-on:* genus of fishes of the order *Plectognathi:*—OSTRACIONIDÆ: family of the same order. They are remarkably distinguished by having the whole body covered with an inflexible tuberculated coat of mail, formed of six-sided bony scales or plates combined in a tesselated quincuncial manner; the fleshy lips, the fins, and the tail protruding through holes in the armor. The gill-opening appears in the armor as a mere slit, bordered with a skinny edge, but there is a true gill-cover within. There are no ventral fins. The vertebræ are generally coalescent. There is little muscular substance, and in some species it is reputed poisonous; but the liver is large, and yields much oil. Some of the species are known by the names of TRUNK-FISH and COFFER-FISH. They are found mostly in the Indian and American seas.

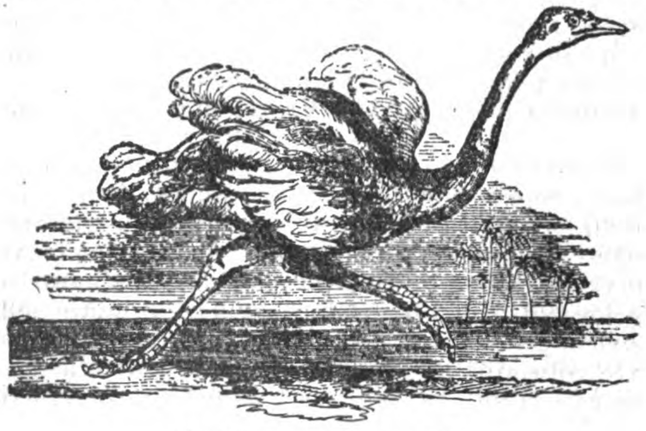
OSTRACISM, n. *ŏs'tră-sĭzm* [Gr. *ostrakismos*—from *ostrăkon*, a tile, a shell]: in *anc. Greece*, banishment by the popular vote by throwing shells into an urn, the name of the person to be banished being written on each shell; banishment; expulsion. OSTRACIZE, v. *ŏs'tră-sīz*, to banish by the popular voice. OS'TRACIZING, imp. OS'TRACIZED, pp. *-sīzd.*—*Ostracism*—as a right of temporary banishment of any person whose services, rank, or wealth appeared dangerous to the liberty of his fellow-citizens, or inconsistent with their political equality—was not a punishment for any particular crime, but rather a precautionary measure to remove leaders whose ascendency was dangerous in the state. O. was introduced by Cleisthenes about the beginning of B.C. 6th c., after the expulsion of the Peisistratidæ. The people were annually asked by the Prytanes if they wished to exercise this right, and if they did, a public assembly was held, and each citizen had opportunity of depositing, in a place appointed for the purpose, a potsherd (*ostrakon*) or small earthen tablet, on which was written the name of the person for whose banishment he voted. Six thousand votes were necessary for the banishment of any person; but the greatest men of Athens—Miltiades, Themistocles, Cimon, Alcibiades, etc.—were subjected to this treatment. The banishment was at first for ten years, but the period was afterward restricted to five. Property and civil rights or honors remained unaffected by it. Alcibiades succeeded in obtaining the final abolition of O., of which, however, Plutarch and Aristotle speak as a necessary political expedient, and its utility has been ably defended in modern times by Grote (*History of Greece*, iv. 200 *et seq.*).

OSTRACITE, n. *ŏs'tră-sīt* [L. *ostrĕă*; Gr. *ostrăkon*, a shell]: a term applied to any fossil oyster.

OSTRACODA, n. plu. *ŏs-trăk'ō-dă*, or OSTRACODES, *ŏs-trăk'ō-dēz* [Gr. *ostrăkon*, a shell; *eidos*, appearance]: an order of crustaceans inclosed in bivalve shields. OSTRACOID, a. *ŏs'tră-koyd* [Gr. *eidos*, resemblance]: having the nature of shell.

OSTREACULTURE, n. *ŏs'trē-ă-kŭl'tūr* [L. *ostrĕă*, an oyster; *cultūra*, tillage]: the artificial cultivation or breeding of oysters.

OSTRICH, n. *ŏs'trĭch* [OF. *austruche* and *ostrusce*, an ostrich: Sp. *avestruz*, an ostrich—from L. *avis*, a bird; *struthio;* Gr. *strouthion*, an ostrich—from *strouthos*, a bird], (*Struthio*): genus of birds of the order *Grallatores*, and tribe *Brevipennes* (q.v.), in Cuvier's system—the order *Cursores* (or Runners) of some ornithologists. In this genus the bill is of moderate length, broad, flattened, rounded at the tip, the mandibles are flexible; the head is small; the neck long; the legs are long (both tibia and tarsus) and very robust, the lower part of the tibia, as well as the tarsus, naked; the feet have only two toes, of which the inner is the largest, and has a short claw, the outer has no claw; the wings are too short for flight, but aid in running; the plumage is lax and flexible; the wings and tail have long soft drooping plumes. Only one species is known (*S. camelus*), native of the sandy deserts of Africa and Arabia; the S. American ostriches, or Nandus (q.v.), constituting a distinct genus. The O. is the largest of all birds now existing, being six to eight ft. in height to the top of its head, and an adult male weighing two to three hundred lbs. The male is rather larger than the female. The head and upper part of the neck are scantily covered with a thin down, through which the skin is visible. The young have the head and neck clothed with feathers. The general plumage is glossy black in the adult male, dark gray in the female and young, with a slight sprinkling of white feathers; the long plumes of the wings and tail are white, occasionally marked with black. On each wing are two plumeless shafts, not unlike porcupine's quills. The inner toe is very large, about seven inches long, and its claw hooflike. The sternum is destitute of a keel, and the muscles which move the wings are comparatively weak; but those which move the legs are of prodigious strength, so that the O. is not only capable of running with great



Ostrich (*Struthio camelus*).

speed, but of striking such a blow with its foot as to make it too formidable for the leopard and other large beasts of prey to assail it. It has been often known to rip open a dog by a single stroke, and a man is recorded to have suffered likewise. The eyes of the O. are large, and the lids are furnished with lashes. Its sight is keen, so that it descries objects at a great distance in the open desert.

The O. shuns the presence of man, but is often seen near herds of zebras, quaggas, giraffes, antelopes, and other quadrupeds. It is gregarious, though the flocks of ostriches are not generally very large. It is polygamous, one male usually appropriating to himself, when he can, two to seven females, which seem to make their nest in common, scooping a mere hole in the sand for this purpose. Each female is supposed to lay about ten eggs. The eggs all are placed on end in the nest, which often contains a large number, while around it eggs are generally to be found scattered on the sand. Concerning these, it has been supposed that they are intended for the food of the young birds before they are able to go in quest of other food; a notion both improbable and without evidence. It seêms at least as likely that these scattered eggs are laid by females waiting while the nest is occupied by another, and that they are lost to the ostriches, and no more regarded. Contrary to a generally received opinion, the O. does not leave her eggs to be hatched entirely by the heat of the sun; nor is it the fact, as alleged, that only the male incubates. Both parents assist in the task of watching the eggs. The male and female sit alternately on the eggs for six weeks; the cock sitting all the night, but the female helping in the daytime.

The O. feeds exclusively on vegetable substances, its food consisting in great part of grasses and their seeds; so that its visits are much dreaded by the cultivators of the soil in the vicinity of its haunts, a flock of ostriches soon making terrible devastation of a field of corn. The O. has a very large crop, a strong gizzard, and a large *proventriculus* between the crop and the gizzard: the intestines are voluminous, and the cœca long, with a remarkable spiral valve. There is a receptacle in which the urine accumulates, as in a bladder, a provision rare in birds. The O. swallows large stones, as small birds swallow grains of sand, to aid the gizzard in trituration of the food; and in confinement, has often been known to swallow indiscriminately whatever came in its way, pieces of iron, bricks, glass, old shoes, copper coins, etc. Its instincts do not suffice to prevent it from swallowing very unsuitable things; copper coins were fatal in one instance, and a piece of a parasol in another. The O. is very patient of thirst, or is capable of subsisting for a long time without water. It often supplies the want of water by eating the gourds or melons of the desert, to which even the lion is said to resort on the same account.

The speed of the O., when it first sets out, is supposed to be not less than 60 m. an hour; but it does not seem long capable of this speed. It is successfully hunted by men on horseback, who take advantage of its habit of running in a curve, instead of a straight line, so that the hunter knows how to proceed in order to meet it and get within shot. It is often killed in s. Africa by men who envelop themselves in ostrich skins, and admirably imitating the manners of the O., approach it near enough for their purpose, without exciting its alarm, and sometimes kill one after another with their poisoned arrows. The strength of the O. is such that it can easily carry two men on its back. The voice of the O. is deep and hollow, not easily distinguished, except by a practiced ear, from the roar of the lion. It also more frequently makes a kind of cackling; and when enraged and striking violently at an adversary, hisses very loudly.

The flesh of the O. is palatable when young, but rank and tough when old. It is generally believed to have been prohibited as unclean to the Jews (Lev. xi. 16), though the name is translated *owl* in the English Bible. There are frequent references to it in the Old Testament. The eggs of the O. are much esteemed as food by the rude natives of Africa, and are acceptable even to European travellers and colonists. Each egg weighs about three lbs., and is thus equal to about two dozen ordinary hen's eggs. The egg is usually dressed by being set upright on a fire, and stirred about with a forked stick, inserted through a hole in the upper end. The thick and strong shell is applied to many uses, but particularly is much used by the s. African tribes for water-vessels. In taking ostrich eggs from the nest, the s. African is careful not to touch any with the hand, but uses a long stick to draw them out, that the birds may not detect the smell of the intruder, in which case they would forsake the nest; while otherwise, they will return, and lay more eggs.

The long plumes of the O., from the tail, back, and wings, have been highly valued for ornamental purposes from very early times, and continue to be a considerable article of commerce. See FEATHERS.

The O. sometimes seen in Europe in confinement, readily becomes quite tame and familiar, though still apt to be violent toward strangers. Great numbers were exhibited in the public spectacles by some of the Roman emperors; and the brains of many ostriches were sometimes presented in a single dish, as at the table of Heliogabalus.

Ostrich-farming.—Attempts are being made to increase the supply of ostrich feathers, or to facilitate the procuring of them, by establishing farms—inclosures where the birds can grow and breed in tameness. The ostrich of S. America, the Nandu (q.v.) or *Rhea*, which is easily tamed, it has been asserted by Dr. Vavaseur, can be acclimatized in n. France: his opinion was, that there is no difficulty in domesticating it; and that it will feed on almost anything given it, however coarse. The birds must not be placed in cages, but must have free range to walk about, secured simply by a leg-guard.

At a meeting of the Cape Agricultural Soc. of Cape Town, s. Africa, 1864, L. von Maltitz gave an account of his experience in ostrich-farming with the African ostrich at Colesberg. Toward the end of 1863, he purchased 17 young ostriches three or four months old, and placed them in an inclosure of 300 acres, over which they had free run. They subsisted wholly on the herbage of the inclosure, with only a little grain given them occasionally. The opinion formed from many months' observation was, that 35 ostriches might find sufficient sustenance upon 300 acres of good grazing-ground. 1864, Apr., he had the wings of the birds cut at the point where the well-known ostrich feathers grow; and they were fit again to cut six months later. The birds were so tame that they allowed themselves to be handled, and their plumage minutely examined. Having caused the birds and the feathers to be examined by experienced dealers, he found that the largest feathers, of which there are 24 on the wing of each male bird, were worth $125 per lb.; and that one plucking of his 17 birds would yield $50 each on an average. The birds cost him about $25 each. Since this experiment, ostrich-farming has become a recognized industry at the Cape. The price of a healthy bird a week old is $50; at six months, $150. The feathers may be plucked when the bird is a year old, and each crop is worth about $35 a bird. The price of the feathers ranges, according to quality, from two or three dollars per lb. to $200 or $250. In 1875 there were 32,247 domesticated ostriches in Cape Colony. It is found that 600 acres of grass are required to feed 80 birds; and when the grass is poor, the ostriches are fed on supplies of shrubs and occasionally on Indian corn. The adult birds require to be kept in separate paddocks, which are generally surrounded by wire-fencing. The egg of the ostrich, though coarse, is reasonably good food; but the naturalization of the bird derives most of its prospective importance from the feathers, for which there is at all times a large demand in the chief European countries, and a market in the United States also.

OSTRICH FEATHERS, in Heraldry; occasionally borne as a charge, and always represented drooping. Three white ostrich feathers are the well-known badge of the Prince of Wales. According to common tradition, they were assumed in consequence of Edward the Black Prince having plucked a plume of ostrich feathers from the casque of John of Luxemburg, King of Bohemia, who fell by his hand at Crécy. There is, however, no doubt that ostrich feathers were previous to that time a cognizance of the Plantagenets. Prince Henry, eldest son of James I., established the present arrangement of the three ostrich feathers within a prince's coronet.

OSTROG, *ŏs-trōg′:* small district town of **w. Russia,** govt. of Volhynia, 100 m. w. of Jitomir. Here, in the reign of Constantine of Ostrog, a school and typography were established, and the first Slavonic Bible printed 1558. Pop. 7,700.

OSTROGOTH, n. *ŏs′trŏ-gŏth* [Dan. *ost*, east, and *Goth*]: one of the eastern Goths, as opposed to *Visigoth*, one of western Goths: see GOTHS.

OSTUNI, *ōs-tô′nē:* city of s. Italy, province of Lecce, 22 m. w.n.w. from Brindisi, on the railway between Ancona and Brindisi; on a steep hill. The city is a flourishing one. Pop. (1881) 15,000.

OSUNA, *ō-sô′nâ:* town of Spain, province of Seville, 48 m. e.s.e. of the city of Seville, in a fertile plain, and on a triangular hill crowned by a castle and the collegiate church. The plain is productive in grain, olives, almonds, etc. An extensive panoramic view is obtained from the castle. The collegiate church, in mixed Gothic and cinque-cento style, built 1534, was pillaged by Soult of 5 cwt. of ancient church plate, and was converted by him into a citadel and magazine. The people are engaged in agriculture and in the manufacture of linen goods, and iron and earthenware. Pop. 17,500.

OS′WALD, SAINT, King of Northumbria: about 604–642, Aug. 5 (reigned 635–642); son of King Ethelfrith. After the death of his father in a battle with the king of East Anglia 617, he fled to a monastery in Scotland or Ireland where he was instructed in the doctrines of Christianity, and is said to have been baptized. He returned to England 633, and in a battle with Ceadwalla near Hexham 635 secured the throne. He married Cyneburg, daughter of a West Saxon king, on condition of her acceptance of Christianity. He introduced Christianity throughout his dominions, and greatly improved the condition of his subjects. His army was defeated and he was killed at Maserfield in a battle with Penda, pagan king of Mercia. He was canonized by the Rom. Cath. Church, and Aug. 5 was marked in the calendar as his day. A cross which he erected on the field of his victory 635 is said to have been the means of many miracles, and numerous legends relating to his career have been published.

OSWALD, *ŏz′wald*, ELEAZER: about 1755–1795, Sep. 30; b. England. His sympathy with the colonists led to his removal to this country about 1770. He engaged in the revolution, was active at Ticonderoga and Quebec, became lieut.col. of artillery 1777, and received honorable mention for gallant service at the battle of Monmouth. While connected with the *Maryland Journal* he became unpopular on account of the publication of Gen. Charles Lee's reflections on the conduct of the war by Washington. He removed to Philadelphia, where he published an intensely partisan paper called the *Independent Gazetteer*. He also established the first commercial paper in the United States, which he issued monthly as the *Price Current*. In New York 1782–87 he published the *Independent Gazette*, in which he violently opposed the policy of Alexander Hamilton. He became an officer in the French army 1792, was sent by the French govt. on a mission to Ireland, returned to this country, and died of yellow fever soon after reaching New York.

OSWALDTWISTLE, *ŏs′wald-twĭs′l:* township in Lancashire, England; on the East Lancashire railroad and the Leeds and Liverpool canal, 3½ m. from Blackburn, 24 m. n. of Manchester. It derives importance mainly from its varied and extensive manufacturing interests, which include cotton and print goods, bleacheries, and chemical works. Large quantities of coal are mined near O., and there are great potteries and extensive stone quarries in the neighborhood. Pop. (1871) 10,283; (1881) 12,206.

OSWEGO, *ŏs-wē′gō:* city, port of entry, and cap. of Oswego co., N. Y., on the shore of Lake Ontario where it receives the O. river, on the Delaware Lackawanna and Western, the New York Ontario and Western, and the Rome Watertown and Ogdensburg railroads, and the Oswego canal; 35 m. n.n.w. of Syracuse, 170 m. by rail w. of Albany, 305 m. n. w. of NewYork; lat. 43° 28′ n., long. 76° 30′ w. It is an important lake port, receives great quantities of grain and lumber from Canada, has a large coast trade, and, when navigation is open there is a regular line of steamers to Chicago and other ports. The site is considerably elevated and sloping. The O. river has a fall of 34 ft. in its course through the city, and 6 dams and locks facilitate navigation and furnish water power. There are 20 churches, a normal school and excellent graded schools, a large public library, 2 daily and 2 weekly newspapers; 2 national banks (cap. $300,000), and 2 savings banks. The city is laid out in squares, the streets are wide and many of them shaded with fine maple trees, there are two large and handsome parks, one on each side of the river, and several smaller squares. There is an ample supply of water and the city is well lighted. The climate, especially in summer, is delightful. Among public buildings are the state armory, a U . S. govt. building, the county court-house, and the city hall. Great quantities of flour, salt, and coal are exported. A large breakwater, commenced by the U.S. govt. 1871, provides a deep harbor with about 4 m. of wharves. There are 12 grain elevators, with total capacity more than 2,000,000 bushels. The manufacture of flour has somewhat decreased, but several large mills are still in operation with a capacity of several thousand bbls. per day. There are several large foundries and machine-shops, large car-works, barrel-factories, sash and door factory, knitting-mills, and the largest starch works in the world, covering about 10 acres of land and using more than a million bushels of corn per year. Ship-building is an important industry, and there are several large planing-mills. Three forts were built in early times to defend the town. Of these Fort Oswego was a centre of interest in the French and Indian war, and was taken by the British 1814; and Fort Ontario has been remodelled, and is constantly garrisoned by U. S. soldiers. As early as 1687 the Onondaga Indians requested the people at Albany to open a trading post and build a fort at the present site of the city, but the proposition was declined. Frontenac came over from Canada 1696, and built a small stockade, which he held only a short time. About 1722 the Iroquois, then in possession of the region, allowed the English and Dutch to open a trading post. They erected a fort 1727, which was abandoned 1744 on account of the French and English quarrels; but 1755 it was strengthened and garrisoned by the English. It was taken by Montcalm, who promised protection, but whose Indian allies massacred about 150 of the prisoners. The fort was again strengthened 1759–60, and was an important point in the operations which resulted in wresting Canada from the French. It was garrisoned by the British till after the revolution, when, by the terms of the treaty, it became the property of the United States. The British regained possession and burned the barracks 1812, May.—O. was incorporated as a village 1828, Mar. 14, and as a city 1848, Mar. 24. Pop. (1870) 20,910; (1880) 21,116; (1890, census first report) 21,826.

OSWE′GO TEA: name given to several species of *Monarda*, particularly *M. purpurea*, *M. didyma*, and *M. kalmiana*, natives of N. America, because of the occasional use of an infusion of the dried leaves as a beverage. They belong to the nat. order *Labiatæ*, somewhat resemble mints in appearance, and have an agreeable odor. The infusion is said to be useful in intermittents, and as a stomachic. Some other species of *Monarda* are used in the same way.

OSWESTRY, *ŏz′ĕs-trĭ:* thriving market-town and municipal borough of England, county of Salop, 18 m. n.w. of Shrewsbury. The stone pillars of its ancient gateways still stand in the streets. There are also scanty remains of a castle, said to have been the ancestral seat of Walter Fitzalan, progenitor of the royal House of Stuart, who, during the troubles of the reign of King Stephen, fled hence to Scotland, and became steward to David I., King of Scotland. O. is the centre of a great agricultural district; it has extensive market-places, and its weekly market for agricultural produce and cattle is largely attended. There are corn-mills and coal-mines in the vicinity. O. contains the offices and works of the Cambrian Company, and is favorably situated as a railway centre. It is said to derive its name from Oswald (q.v.), King of Northumbria, slain here 642. Near the town is Oswald's Well, a fine spring of water; and 'Old O.,' an ancient encampment. Pop. (1881) municipal borough 7,851.

OSYMANDYAS, *os-ĭ-măn'dĭ-as:* a great king of Egypt, mentioned by Diodorus and Strabo, who reigned, according to these authors, as the 27th successor of Sesostris, and distinguished himself by his victories—invading Asia with an army of 400,000 men and 20,000 cavalry, and conquering the Bactrians, who had been rendered tributary to Egypt by Sesostris. In honor of this exploit he is said by Hecatæus to have erected a monument which was at once a palace and a tomb, and which, under the name of *Osymandeion*, was renowned for size and splendor in later times. It was said to be in the necropolis of Thebes, or at Gournah, close to the sepulchres of the concubines of the god Amen Ra. The Osymandeion is generally believed to be represented by the extant ruins of the palace of Rameses III. at Medinet Haboo, though great difficulty has been felt in reconciling the descriptions of its magnificence in ancient writers with the dimensions of the modern relic; and Letronne, in *Tombeau d'Osymandyas* (Par. 1831), has even ventured to suppose that it was an imaginary edifice invented by the Greeks from their acquaintance with the great palaces of Thebes; but this skepticism is considered extreme. The name of O. is difficult to recognize among the Egyptian kings, the nearest approach to it being one of the Setis, either the 1st or 2d, called after death, Asiri-Meneptah. Others consider O. the Ismendes of Strabo, or the Mendes of Herodotus. The name of Amenophis may also lie concealed in his name, so much ambiguity pervades the subject.

Diodorus, i. 46 to 50; Strabo, xvii. 8, 11-16; Juvenal, xv. 38; Letronne, *Mem. de l'Inst.* ix. 321; Champollion, *Lettres Écrites*, 260, 303; Champollion-Figeac, *L'Égypte*, 69, 291, 313–315.

OTACOUSTIC, a. *ŏt'ă kow'stĭk* [Gr. *ōta*, ears; *akoustikos*, belonging to the sense of hearing]: assisting the sense of hearing: N. an instrument for assisting hearing; called also an OT'ACOUS'TICON, n. *-kow'stĭ-kŏn.*

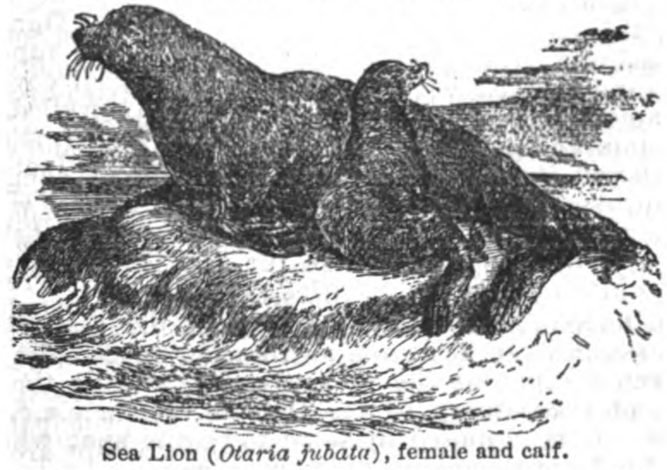
OTAGO, *ō-tâ'gō:* one of the most recent settlements, but the most prosperous, populous, and likely to become the most influential 'provincial district' of New Zealand. Since the re-incorporation of Southland—a portion of its territory which (1861) was parted from O. and raised into a small separate province, an experiment which soon failed—it is the most southern province of South Island (see NEW ZEALAND). O. is bounded n. by the province of Canterbury, and w., e., and s. by the Pacific Ocean; has length 200 m., breadth 160 m., with an invaluable line of coast 400 m.; area about 15,500,000 acres—more than 24,000 sq. m. The chief rivers are the Waitaki, the Clutha, and the Mataura, all flowing s.s.e., and navigable to some extent. The w. regions of O. remain unsurveyed, but are known to be covered with high, and in many cases snow-capped mountains, stretching along the whole line of coast, and extending inland more than 60 m. E. and n.e. from the Mataura river to the shore the surface is well known, and consists of mountain-ranges with their valleys, extending parallel to the sea and to each other as far inland as the valley of the Manuherikia, one of the first affluents of the Clutha. The climate of O. is exceedingly healthful and invigorating; frost and snow are unknown except in the higher ranges, and rain, though sufficiently abundant to answer the demands of agriculture, does not interfere with outdoor occupations. All the English fruits and flowers, with insignificant exceptions, are grown here to perfection. The n. and interior districts of the province are eminently adapted in both soil and climate for agriculture as well as cattle-breeding. The w. districts are rugged, and covered with forests; but in the e. regions are many fertile and well-watered tracts, admirably suited for production of corn, and rearing of cattle and sheep. In mineral wealth the province is remarkably rich. Coal, iron, copper, silver, lead, etc., have been found, and useful earths and clays are abundant. Gold has been found in small quantities in other provinces of New Zealand, as in Auckland and Nelson Province; but by far the most important gold-fields of the colony are in the province of Otago. Gold was discovered here 1861, June, in a gully, since called Gabriel's Gully, on the Tuapeka, affluent of the Clutha, 37 m. w. of Dunedin. Read placed his discovery in the hands of govt., and was presented by the provincial council with £500 as a reward. In less than two months from the discovery of gold, 3,000 people were at work in the Tuapeka valley, and were obtaining 6,000 oz. a week. From this time gold-mining became a staple employment. A 'rush' was made from Australia; Dunedin, formerly the village-capital of the province, rapidly increased in size and trade, new fields were discovered, and the immigration-lists were immensely swelled. From 1861, June, to 1863, June, 700,000 oz., worth nearly £3,000,000, were obtained. The most productive gold-field hitherto discovered is the Arrow River District, in the vicinity of Lake Wakatip. This district was made known 1862, Nov., and from that time to 1863, Oct. 31, 237,655 oz.—value £955,620 (=$4,650,524)—were forwarded to Dunedin. The value of the gold exported from O. to the middle of 1880 was £15,818,948 (=$76,982,910). In 1880 the total exports were valued at £1,989,901 (=$9,683,853), imports £1,938,101 (=$9,675,093). Gold, wool, timber, and agricultural produce are principal articles of export. In agriculture, the chief growths are wheat, oats, barley, potatoes, and hay: 1880 there were 53,771 acres in wheat, 143,165 in oats, 10,114 in barley, 5,290 in potatoes, 111,278 in grass. The first band of settlers reached the shores of O. in the spring of 1848. The capital is Dunedin (q.v.), whose pop., with its suburbs and various boroughs was (1881) 42,802. O. was originally a class colony connected with the Free Church of Scotland; but the influx of immigrants consequent on the discovery of gold has obliterated its distinctive character. Pop. (1871) 69,500; (1881) 135,418.

OTAHEI'TE: see TAHITI.

OTAHEITE APPLE, n. *ŏ-ta-hī'tē ăp'pl:* in *bot.*, *Spondias dulcis*, a handsome tree, the fruit of which is of a golden color, has a flavor like that of a pineapple, and hanging in little nodding bunches; cultivated in the Society and Friendly Islands, especially in Otaheite (Tahiti).

OTALGIA, n. *ō-tăl'jĭ-ă* [Gr, *ōta*, ears; *algos*, pain]: neuralgia of the ear. It occurs in fits of excruciating pain, shooting over the head and face, but is not accompanied by fever, nor usually by any sensation of throbbing. Its causes and treatment are those of neuralgia generally, but it is caused particularly by caries of the teeth, and always requires careful examination by a dentist. When patients complain of *ear-ache*, the pain is far more commonly due to *Otitis* (q.v.), or inflammation of the tympanic portion of the ear, a much more serious affection.

OTARY, *ō'ta-rĭ* (*Otaria*) : genus of the Seal family (*Phocidæ*), distinguished from the rest of the family by a projecting auricle or auditory conch (often popularly called 'external ear'), and by a very remarkable character, a double cutting edge in the four middle upper incisors. The membrane which unites the toes of the hind-feet is prolonged into a flap beyond each toe. The fore-legs, as if intended exclusively for swimming, are placed further back in the body than in the true seals, giving the otaries the appearance of having a longer neck. The hind-legs are more like the fore-legs than in the true seals.—The SEA LION (*O. jubata* or *O. Stelleri*) of the northern seas is about 15 ft. in length, and weighs about 16 cwt. It inhabits the e. shores of Kamtchatka, the Kurile Islands, etc., and is in some places extremely abundant. It is partially migratory, removing from its most northern quarters on the approach of winter. It is found chiefly on rocky coasts and islet rocks, on the ledges of which it climbs, and its roaring is sometimes useful in warning sailors of danger. It is much addicted to roaring, which, as much as the mane of the old males, has obtained for it the name sea lion. The head of this animal is large; the eyes very large; the eye-



Sea Lion (*Otaria jubata*), female and calf.

brows bushy; the hide thick; the hair coarse, and reddish; a heavy mass of stiff, curly, crisp hair on the neck and shoulders. The old males have a fierce aspect, yet they flee in great precipitation from man; but if driven to extremities, they fight furiously. Sea lions are capable of being tamed, and become very familiar with man. They are polygamous, but a male generally appropriates to himself only two or three females. They feed on fish and the smaller seals.—The sea lion of the southern seas, once supposed to be the same, is now generally believed to be a distinct species, and, indeed, more than one species are supposed to inhabit those seas.—The URSINE SEAL, URSINE O., or SEA BEAR (*O. Ursina*), inhabitant of the n. Pacific, is scarcely 8 ft. long. The hinder limbs being better developed than in most of the seals, it can stand and walk almost like a land quadruped. The muzzle is prominent, the mouth small, the lips tumid, the whiskers long; the tip of the tongue is bifurcated, the eyes are large, the skin is thick, the hair long, erect, and thick, with a soft underclothing of wool. The food consists of sea otters, small seals, and fish. The ursine seal is polygamous, a strong male appropriating to himself 8 to 50 females. It swims with great swiftness, and is fierce and courageous. Its skin is prized for clothing in the regions in which it abounds. As in the case of the sea lion, it is doubtful if the geographical range of the sea bear extends to the southern seas, or if it is represented there by a similar species. Several other species of O. are inhabitants of the Pacific and southern oceans. The FUR SEAL (*O. Falklandica*), is one of these. It is found on the Falkland Islands, South Shetland, etc. It is of long and slender form, with broad head, and clothed with soft, compact, grayish-brown hair, among which is a very soft, brownish fur. It is gregarious and polygamous. When South Shetland was first visited, its seals had no apprehension of danger, and unsuspectingly remained while their fellows were slain and skinned; but they have since learned to be on their guard. The skin of the fur seal is in great demand, chiefly for ladies' mantles.

OTCHAKOV, *ŏch-â-kŏv′:* small town and seaport of s. Russia, govt. of Kherson, surrounded on all sides by a barren steppe; at the w. extremity, and on the n. shore, of the estuary of the Dnieper, 40 m. e.n.e. of Odessa. It is supposed by some to be the spot where stood the Grecian colony Olbia; by others, to be Tomi, the scene of Ovid's banishment. At the end of the 15th c., the khan of the Crimea built here a strong fortress. Its present name occurs, for the first time 1557. During the wars of Russia with Turkey in the 18th c., O. was alternately the property of each, until it was taken by Potemkin 1788, and definitely annexed to the Russian dominions. The vicinity of Odessa prevents the development of foreign commerce at its port. Pop. (1877) 5,140, the greater part Jews, employed in salting fish for transport to Little Russia.

OTEY, *ō'tĭ*, JAMES HERVEY, D.D.: 1800, Jan. 27—1863, Apr. 23; b. Liberty, Va. He graduated from the Univ. of North Carolina 1820, was a tutor in that institution 1820–23, in the latter year commenced teaching at Warrenton, N. C., was ordained deacon and priest in the Prot. Episc. Church 1825, and removed 1827 to Franklin, Tenn., being the first clergyman of the denomination to settle in the state. He afterward removed to Columbia, and later to Memphis. He was consecrated bp. of Tenn. 1834, and labored with energy and zeal to promote the cause of Christ and provide means for religious education of the people. Largely through his efforts the Univ. of the South was established at Suwanee, Tenn. He travelled extensively on missionary tours, and was widely known as "The Good Bishop." His published works include *Unity of the Church* and other discourses, and many sermons and addresses. He d. at Memphis, Tenn.

OTHER, a. *ŭth'ėr* [Goth. *antnar;* Ger. *ander;* Fris. *ander*, other, or: Icel. *annarr;* Skr. *antara*, the other]: not the same; not this but different; correlative to *each*, and opposed to *some;* something besides; used as a *noun* with number and case, signifying, not I or he, but some one else, as 'let others judge'. OTHERWISE, ad. *ŭth'ėr-wīz*, in a different manner; in other respects; by other causes.

OTHMAN', or OTHOMAN', or (usual form) OSMAN' I., surnamed *Alghazi* ('the conqueror'): founder of the Turkish power and of the dynasty of Osmanli or Ottoman Turks: 1259–1326 (sultan 1299–1326): b. in Bithynia. His father, Orthogrul, chief of a small tribe of Ogûzian Turks, had entered the service of Alla-ed-din Kaikobad, the Seljuk sultan of Iconium, and had rendered important services to that monarch and his successors in their wars with the Byzantines and Mongols. Orthogrul dying 1289, after a rule of more than half a century, his tribe chose his son Osman (i. e., the 'young bustard') as his successor. O. trod in his father's footsteps; and on the destruction of the sultanate of Iconium 1299 by the Mongols, succeeding in obtaining possession of a portion of Bithynia. He had previously subjugated many of the neighboring Oguzian chiefs, and this new accession of territory rendered him powerful enough to attack the Byzantines with success. 1299, July, he forced the passes of Olympus, and took possession of the whole territory of Nicæa, with the sole exception of the town of Nicæa, which resisted his efforts for five years longer. In 1301 he defeated Emperor Andronicus II. at Baphaeon; 1307, he incorporated the province of Marmara in his dominions; and till his death, steadily pursued his plans of conquest. 'Othman,' says Knolles, 'was wise, politic, valiant, and fortunate, but full of dissimulation, and ambitious above measure; not rash in his attempts, and yet very resolute; to all men he was bountiful and liberal, especially to his men of war and to the poor. Of a poor lordship, he left a great kingdom (Phrygia, Bithynia, and the neighboring districts), having subdued a great part of Asia Minor, and is worthily accounted the first founder of the Turks' great kingdom and empire.' O. assumed the title Sultan (though this is denied by many historians) on the extinction of the Iconium sultanate 1299, held his court at Kara-Hissar, and struck money in his own name. From him are derived the terms Ottomans, Othomans, and Osmanli or Osmanlû, employed as synonomous with Turks. See OTTOMAN EMPIRE.

OTHMAN IBN AFFAN, *ŏth-mân′ ĭb′n âf-fân′*: third Caliph of the Moslems: b. about 574; of the family of the prophet, and cousin-german of Abu Sofîan. One of the early converts to Islam, he was one of its most zealous supporters, and linked himself still more strongly to Mohammed by becoming his son-in-law and private secretary. He was elected to succeed Omar in the Caliphate 644, Dec., and a most unworthy successor he proved to be. The Moslem empire, however, continued to extend itself on all sides till the insane nepotism of O. gave its progress a sudden check. The able and energetic leaders who had been appointed by Omar were superseded by members of O.'s own family, and of that of Abu Sofîan. Egypt revolted, and the caliph was compelled to reinstate Amru in the govt. of that country; and several other rebellions were quelled only by a similar restoration of the previous governors. Zealous Moslems were indignant at seeing the chair of the prophet occupied by O., while Abu-bekr, and even Omar, were accustomed to seat themselves two steps below it. Emboldened by his vacillating and cowardly disposition, they showered upon him reproaches and menaces; but the bearer of their remonstrances having been bastinadoed by O.'s order, a general revolt ensued. O. averted the crisis by unconditional submission; but having soon afterward attempted to put to death Mohammed, son of the Caliph Abu-bekr, the latter made his appearance at Medina at the head of a troop of malcontents, and forcing his way to the presence of O., stabbed him to the heart. O. was the first to cause an authentic copy of the Koran to be composed.

OTHO, *ō'thō*, MARCUS SALVIUS, Roman Emperor: 32, Apr. 28—69, Apr. 15 (reigned 69, Jan. 15–Apr. 15); of an ancient and noble Etruscan family. He was a favorite companion of Nero, who appointed him gov. of Lusitania. On the revolt of Galba against Nero, O. joined himself to the former; but, disappointed in his hope of being proclaimed Galba's successor, he marched at the head of a small band of soldiers to the forum, where he was proclamed emperor, and Galba was slain. O. was recognized as emperor over all the Roman possessions except Germany, where a large army was stationed under Vitellius. The first few weeks of his reign were marked by an indulgence toward his personal enemies, and a devotion to business, which, though at variance with his former passionate and reckless habits, excited favorable hopes in the minds of his subjects. But the tide of rebellion raised in Germany by Valens and Cæcina during the reign of Galba had by this time gathered strength, and these commanders having prevailed on Vitellius, who had become a mere good-humored glutton, to join his forces to theirs, the combined army poured into Italy. O. fortunately had several able generals, who repeatedly defeated the rebels; but the prudence of some among them in restraining the enthusiasm of their troops, who wished to press their victories further, was unfortunately considered as cowardice or treason, and produced dissensions in O.'s camp. This encouraged the generals of Vitellius to unite their armies, and fall on the forces of Otho. An obstinate engagement took place near the junction of the Adda and the Po, in which the army of O. was completly routed, and the relics of it went over on the following day to the side of the victor. O., though not yet reduced to extremity, resolved to make no further resistance; settled his affairs with the utmost deliberation; and then stabbed himself, after a reign of only three months.

OTHO I., or THE GREAT, Holy Roman Emperor: 912–973, May 7 (reigned 936–973); son of Henry I. King of Germany, whom he succeeded. His reign was a series of eventful and generally triumphant wars, in the course of which he brought many turbulent tribes under subjection, acquired and maintained almost supreme power in Italy, where he imposed laws with equal success on the kings of Lombardy and the popes of Rome, consolidated the disjointed power of the German emperors, and established Christianity at many different points in the Scandinavian and Slavonic lands beyond his own jurisdiction. His earliest achievement was a successful war against the Bohemian Duke Boleslas, whom he reduced to subjection, and forcibly converted to Christianity; next, the dukes of Bavaria and Franconia were compelled to succumb to his power; the former paying the penalty of his opposition to O. by defeat and death in battle, and the latter by the confiscation of his territories, which, together with the other lapsed and recovered fiefs of the empire, were bestowed on near and devoted relatives of the conqueror. After subduing the Slavi of the Oder and Spree, for whose Christian regeneration he founded the bishoprics of Havelburg and Brandenburg, driving the Danes beyond the Eyder, compelling their defeated king to return to the Christian faith and to do homage to him; and after founding, at the suggestion of his mother's former chaplain, Adeldag, the bishoprics of Aarhuus, Ribe, and Slesvig, which he decreed were forever to be free from all burdens and imposts, he turned his attention to the affairs of Italy. Here he presented himself as the champion of the beautiful Adelheid, widow of the murdered King Lothaire; and having defeated her importunate suitor, Berengar II. (q.v.), married her, and assumed supreme power over n. Italy 951. The wars to which this measure gave rise, obliged O. frequently to cross the Alps; but at length, after a great victory over the Huns 955, and the defeat and capture of Berengar, O. was acknowledged king of Italy by a diet at Milan; and after being crowned with the iron crown of Lombardy, was, 962, recognized by Pope John XII. as successor of Charlemagne, and crowned Emperor of the West at Rome. O. lost no time in asserting his imperial prerogatives; and having called a council, effected the deposition of Pope John, whose licentiousness had become a burden to Italy and a scandal to Christendom, and caused Leo VIII. to be elected in his place. Fresh wars were the result. Popes and anti-popes distracted the peace of Rome; but through all these disorders, O. maintained the supremacy which he claimed as Emperor of the West, in regard to the election of popes and the temporal concerns of the Roman territories. His later years were disturbed by domestic differences; for his elder son, Ludolph, and his son-in-law, Konrad of Lorraine, having risen in rebellion against him, through jealousy of his younger son and intended successor, Otho, the empire was distracted by civil war. Although the war terminated in the defeat of the rebels, and the recognition of young Otho as king of the Germans, and his coronation at Rome, 967, as joint-emperor with his father, O.'s favorite scheme of uniting the richly-dowried Greek princess, Theophania, with the young prince, met with such contempt from the Greek emperor, that his outraged pride soon again plunged him into war. His inroads into Apulia and Calabria, however, proved convincing arguments in favor of the marriage, and Theophania became the wife of young Otho, with Calabria and Apulia for her dowry. O. died at Minsleben, in Thuringia, and was buried at Magdeburg, leaving the character of a great and just ruler, who had extended the limits of the empire, and restored the prestige of the imperial power more nearly to the stand which it occupied under Charlemagne than any other emperor. He created the duchy of Carinthia, and the markgrafdoms of East and North Saxony; appointed counts-palatine; and founded cities and bishoprics. See Vehse's *Leben Kaiser O.'s des Grossen* (Dresd. 1827).

O'THO II., surnamed Rufus, 'the Red,' King of Germany and Holy Roman Emperor: 955–983, Dec. 7 (king 961–973, emperor 967–973); son of Otho I., whom he succeeded. For a time, O. ruled under the regency of his mother, Empress Adelheid; but differences arose through his headstrong and ambitious inclinations, and his mother withdrew, leaving him to his own will, which soon brought him into collision with the great vassals of the crown. Civil war broke out under the leadership of his cousin, Duke Henry II. of Bavaria, who formed a secret alliance against him with Harold, king of Denmark, and Micislav of Poland. For a time fortune favored the rebels; but O.'s astuteness circumvented their designs; and after defeating Henry, and depriving him of his duchy, he marched against the Danish king, who had been making successful incursions into Saxony. O.'s first attack on the Dannevirke having proved of no avail, he retired, vowing that he would return before another year and force every Dane to forswear paganism. Returning to the attack the following year, according to the old chroniclers he caused large quantities of trees, brushwood, and stubble to be piled up against the Dannevirke and set on fire, driving out the defenders. The defeated Harold was soon overpowered by the superior number of the Germans, and compelled to receive baptism, as the badge of his defeat. The next scene of war was Lorraine, which the French king, Lothaire, had seized as a former appanage of his crown; but here, after a partial defeat, O. succeeded in reasserting his power; and then devastated Champagne, pursued and captured Lothaire, and advanced on Paris, one of whose suburbs he burned. Scarcely was this war ended, when the disturbed condition of Italy called O. across the Alps. His presence ended the insurrection at Milan and Rome, where he re-established order; and having advanced into lower Italy, he defeated the Saracens, drove back the Greeks, re-established his supremacy in Apulia and Calabria, which he claimed in right of his wife, Theophania, and made himself master of Naples and Salerno and finally of Tarentum 982. The Greek emperor, alarmed, called the Saracens again into Italy. The result of a battle with their overwhelming numbers was the total defeat of the emperor, who escaped from the hands of the victors only by plunging with his horse into the sea, and swimming, at the risk of his life, to a ship. Unluckily, it was a Greek ship, and O. was virtually a prisoner; but as the vessel neared Rossano, a friendly port, he escaped by a cunning stratagem. O. hastened to Verona, where a diet was held, numerously attended by the princes of Germany and Italy, and at which his infant son, Otho, was recognized as his successor. This diet is memorable chiefly for the confirmation by O. of the franchises and privileges of the republic of Venice, and the enactment of many new laws added to the celebrated Longobard code. O.'s death at Rome arrested the execution of the vast preparations-against the Greeks and Saracens planned at the diet of Verona, and left the empire embroiled in wars and internal disturbances. See Giesebrecht's *Jahrbücher des Deutschen Reichs unter der Herrschaft, Kaiser O.'s II.* (Berl. 1840).

O'THO III., King of Germany and Holy Roman Emperor: 980–1002, Jan. 21 (king 983–996, emperor 996–1002); son of Otho II., at whose death he was immediately crowned as king at Aix-la-Chapelle. For 13 years till O. received the imperial crown at Rome, the government was administered with extraordinary skill and discretion by three female relatives of the boy-king—his mother Theophania, his grandmother Adelheid, and his aunt Matilda, Abbess of Quedlingburg. The princes of the imperial family disputed the right of these royal ladies to the custody of the young king; and Duke Henry of Bavaria, the nearest agnate, having seized the person of O., tried to usurp the supreme power, proposing to govern in his name; but opposed by the majority of the other princes of the empire, he was compelled to release him in consideration of receiving back his forfeited duchy. O. early showed that he had inherited the great qualities of his forefathers, and when scarcely 15 years of age, at the head of his army, defeated the troops of the patrician Crescentius, self-styled consul of Rome, and thus restored order in the Roman territories. In 996 he was crowned emperor by his relative, Pope Gregory V.; and having settled the affairs of Italy returned to Germany, where he defeated the Slaves, who had long been at war with the empire; and having forced Micislav, duke of Poland, to do him homage, he subsequently raised the Polish territories to the rank of a kingdom, in favor of Micislav's successor Boleslas. The renewed rebellion of Crescentius, who drove Gregory from the papal throne, compelled O. to return to Italy, where success as usual attended his measures. Crescentius, who had thrown himself into San Angelo, was seized and beheaded, with 12 of his chief adherents; the anti-pope, John XVI., imprisoned; Gregory restored; and on the speedy death of the latter, O.'s old tutor, Gherbert, Abp. of Ravenna, raised to the papacy under the title Sylvester II. O., elated with success, took up his residence in Rome, where he organized the government, erected new buildings, and showed every disposition, notwithstanding the ill-concealed dissatisfaction of the Romans, to convert their city into the capital of the western empire. The near approach of the year 1000, to which so many alarming prophecies were then believed to point as the end of the world, induced O. to undertake a pilgrimage to the Holy Land, where he founded an archbishopric. On his return, after visiting Charlemagne's grave at Aix-la-Chapelle, and removing the consecrated cross, suspended from the emperor's neck, he again repaired to Rome, to consolidate his schemes of establishing a Roman empire. The insurrection of the Romans frustrated his plans, and escaping from Rome at risk of his life, he withdrew to Ravenna, to await the arrival of powerful reinforcements from Germany; but before they had crossed the Alps, O. died at the age of 22, apparently from poison said to have been administered by the widow of Crescentius, who, it is said, had deliberately set herself to win his affections that she might have an opportunity of avenging the death of her husband. With O. the male branch of the Saxon imperial house became extinct. See Wilman's *Jahrbücher des Deutschen Reichs unter Kaiser Otto III.* (Berl. 1840).

O'THO I., King of Greece: 1815, June 1—1867, June 26 (reigned 1835–62); b. Salzburg; second son of Ludwig, King of Bavaria. On the erection of Greece into a kingdom 1832, he was appointed by the protecting powers king of Greece. Till he attained his majority, the government was intrusted to a regency. On assuming the government 1835, O. transferred the court from Nauplia to Athens, and passed into law several important measures, which afforded lively satisfaction to his subjects. In 1836 he married Princess Amalie of Oldenburg. Amid internal disorders, and diplomatic intrigues of foreign powers, a monetary crisis, due partly to false administrative measures, and partly to too prompt demands for repayment on the part of the protecting powers, threw affairs into confusion, and weakened the king's popularity. A national reaction against the Germanizing tendencies of the court followed, and rose to a military revolt 1843, which was suppressed. Though the Bavarian ministers were dismissed, the king and his Greek advisers showed reactionary tendencies, and sought to curtail the privileges which the new constitution had conferred on the people. The equivocal position in which he was placed 1853, between the allied powers and his subjects whose sympathies were with Russia, increased the difficulties of his situation. The occupation of the Piræus by Anglo-French troops restrained the people till 1857; but after their withdrawal, his position became year by year more difficult. The belief that O.'s absolute measures were due to the queen's instigation, turned the people against her, and attempts were made on her life. Insurrections at Nauplia and Syra 1862 were suppressed. A more formidable insurrection in the districts of Missolonghi, Acarnania, Elis, and Messenia, in Oct. of the same year, in a few days extended to the whole of Greece; and O. and his queen fled to Salamis, whence he issued a proclamation declaring that he quitted Greece to avoid effusion of blood. A provisional govt. was established, which, 1863, Feb., resigned its power to the national assembly, which confirmed its acts, and decreed that Prince Alfred of England had been duly elected king of Greece. He refused the throne; and their choice fell on Prince William of Slesvig-Holstein-Sonderburg-Glucksburg, second son of Christian IX., King of Denmark, who, 1863, Sep., assumed royal functions, under the title George I., King of the Hellenes.

OTIC, a. *ŏt′ĭk* [Gr. *ous*, the ear, *ōtos*, of the ear]: pertaining to the ear; employed in diseases of the ear. OTIC GANGLION (called sometimes Arnold's ganglion), one of the four cephalic sympathetic ganglia: it is immediately below the foramen ovale.

OTIOSE, a. *ō′shĭ-ōs* [L. *otiōsus*, at leisure—from *otĭŭm*, leisure, vacant time]: being at rest or ease; unemployed.

OTIS, *ō′tĭs*, GEORGE ALEXANDER: 1830, Nov. 12—1881, Feb. 23; b. Boston: surgeon. He graduated from Princeton College 1849, and from the medical dept. of the Univ. of Pennsylvania 1851, studied surgery at London and Paris, and 1854 commenced practice at Springfield, Mass. He was a surgeon in the civil war, and became asst. surgeon U. S. army 1866, and was stationed at the surgeon-general's office at Washington. He won several brevets, and was a member of the leading medical societies. He was a contributor to various medical journals, and wrote *Amputation at the Hip-Joint*, *Excisions of the Head of the Femur*, and other monographs. He also prepared a voluminous *Report of Surgical Cases treated in the Army of the U. S. from* 1867 *to* 1871, and edited the surgical portion of the *Medical and Surgical History of the War*. He d. at Washington.

O′TIS, HARRISON GRAY: 1765, Oct. 8—1848, Oct. 28; b. Boston; son of Samuel Alleyne O., and nephew of James O., the patriot orator. He graduated from Harvard College 1783, studied law, and was admitted to practice 1786. As capt. of the militia he aided in suppressing Shay's rebellion 1787, and the following year was the Fourth of July orator at Boston. He soon became a leading lawyer and was popular in social circles. He entered the Mass. legislature 1796, and was a member of congress 1797–1801. In the latter position he was a pronounced federalist. In 1801 he was dist.atty. at Boston, was speaker of the Mass. house of representatives 1803–05, pres. of the state senate 1805–11, and judge of common pleas 1814–18. He was prominent in the Hartford convention 1814, for which he was charged with disloyalty. He was elected to the U. S. senate 1817, but resigned 1822 in hope of being elected the first mayor of Boston. A preliminary canvass indicated that his course at Hartford had made him so unpopular that he could not succeed, and his name was withdrawn. He was elected mayor 1829, held the office 3 years, and passed the remainder of his life as a private citizen. He d. at Boston.

O′TIS, JAMES: 1702, June 14—1778, Nov. 9; b. Barnstable, Mass.; son of Judge John O. He was not educated at college, but studied law, and was very successful in his profession. He was an ardent patriot, a col. of the militia, a member of the legislature for several years, and was speaker of the house 1760–61. He was an unsuccessful applicant for the office of associate justice, was probate judge of Barnstable co. 1763, and became chief-justice of the common pleas 1764. He was

elected member of the governor's council several years in succession, but each time the royal gov., Bernard, refused to ratify the choice. In 1770 Lieut.Gov. Hutchinson admitted his election. For some years O. was pres. of the council.

O'TIS, JAMES: patriot and orator: 1725, Feb. 5—1783, May 23; b. West Barnstable, Mass.; son of James O. the chief-justice of common pleas. He graduated from Harvard College 1743, studied literature two years, became a law-student in the office of Jeremiah Gridley, a leading lawyer, was admitted to practice 1748, and settled at Plymouth. Not having sufficient business he removed to Boston 1750, where his practice greatly increased, and he obtained high reputation as an orator and a scholar. He wrote *Rudiments of Latin Prosody*, 1760, which became a standard text-book. He also wrote a book on Greek prosody, but as no printer in the country had Greek type it was not published, and the MS. was lost. His opposition to the royal govt. developed 1761, and was claimed by some to have been greatly intensified, if not wholly caused, by the refusal of Gov. Bernard to give his (O.'s) father the position of chief-justice for which he had applied on the death of Sewall. The effort of the govt. to enforce certain navigation laws which had fallen into disuse made it necessary to test the legality of the writs of assistance which allowed custom-house officers to search houses for smuggled goods without specifying the houses in the warrant. As the advocate-gen. of the govt., it devolved on O. to defend the revenue officers in their efforts to carry out the measure. This he not only refused to do, but resigned his office, appeared against the govt., made a brilliant speech in opposition to the measure itself and its underlying principle, and refused compensation for his services to the people. Decision was reserved till the home govt. could act upon the matter; and though the right to issue the writs was maintained, it is believed that it was no longer enforced. The following year (1762) O. was a member of the state legislature, where he became the leader of the opposition to the royal govt. In justification of his course in opposing a grant to pay the cost of a naval expedition, he published 1764 a pamphlet, *The Rights of the Colonies Vindicated.* It was due to his efforts that the stamp act congress was held in New York 1765, by which he was appointed a member of the committee for appealing the case to parliament. His election as speaker of the Mass. house of representatives was negatived 1767 by Gov. Bernard. His defense of the action of the Mass. legislature in issuing a circular to the other colonies urging resistance to the imposition of taxes by parliament was characterized by sympathizers with the royal party as 'the most violent, insolent, abusive, and treasonable declaration that perhaps was ever delivered.' He was accused in England 1769, by the commissioners of customs, of treason; but refuted the charge and denounced his accusers in the

Gazette of Boston. Soon afterward he met one of the parties, named Robinson, in a coffee room, and in a quarrel which ensued received a cut on the head which greatly aggravated a mental disease of which premonitory symptoms had already appeared. For this injury the courts awarded O. £2,000 damages; but on receipt of a written apology from his assailant he waived his financial claim. He was a member of the legislature 1771, and occasionally attended court, but except for brief periods was insane and wholly incapacitated for business. It is said that unknown to his family he borrowed a musket and took part in the battle of Bunker Hill. While standing in a doorway at his home in Andover he was instantly killed by lightning.

OTITIS, n. *ō-tī′tĭs* [Gr. *ōta*, the ears, and termination *-itis*, denoting inflammation]: inflammation of the tympanic cavity of the ear. It may be either acute or chronic; and may come on during the course of certain febrile affections, especially scarlatina, or in consequence of a scrofulous, rheumatic, or gouty constitution; or it may be excited by direct causes, as exposure to currents of cold air, violent syringing or probing, etc. The symptoms of the acute form are sudden and intense pain in the ear, increased by coughing, sneezing, or swallowing, *tinnitus aurium*, or singing or buzzing noises heard by the patient, and more or less deafness. If the disease is unchecked, suppuration takes place, and the membrane of the tympanum ulcerates, and allows the discharge of pus; or inflammation of the dura mater and abscesses in the brain may be established. In less severe cases there is usually considerable persistent damage, and an obstinate discharge of matter (*otorrhœa*) is a frequent sequence of the disease. The treatment of so serious an affection must be left solely in the hands of the medical practitioner.

The symptons of the cronic and less acute varieties of O. are unfortunately so slight, that they are often neglected, until the patient finds the sense of hearing in one or both ears almost completely gone. In these milder forms, the general treatment is to combat the diathesis on which they frequently depend, and to improve the general health. Small blisters occasionally applied to the nape of the neck or to the mastoid process are often of service in very chronic cases. If there is any discharge, the ear should be gently syringed once or twice a day with warm water, after which a tepid solution of sulphate of zinc (one grain to an ounce of water) may be dropped into the meatus, and allowed to remain there two or three minutes.

OTLEY, *ŏt′lĭ:* small market-town of England, in the West Riding of Yorkshire, on the right bank of the Wharfe, 29 m. w.s.w. of York. Its parish church was built 1507. Extensive cattle and grain markets are held here. Worsted spinning and weaving, machine-making, and manufacture of malt, bricks, and leather, are main occupations. Pop. (1871) 5,855; (1881) 6,803.

OTOCONIA, n. *ŏt′ŏ-kō′nĭ-ă* [Gr. *ōta*, the ears; *kŏnĭă*, dust]: a small mass of calcareous particles or crystals of carbonate of lime, found in the membranous labyrinth of the ear, smaller and more numerous than otoliths.

OTOCRANE, n. *ŏt′ō-krān* [Gr. *ōta*, the ears; *kranĭŏn*, the skull]: the part of the skull which contains the organs of hearing.

OTOLITHS, n. plu. *ŏt′ō-lĭths*, also OT′OLITES, n. plu. *-lītz* [Gr. *ōta*, the ears; *lithos*, a stone]: the fossil ear-bones of whales, cartilaginous fishes, etc.; minute calcareous concretions found in the membranous cavities of the ears of many invertebrates.

OTOLITHUS, *ō-tŏl′ĭ-thŭs* : genus of fishes of the family *Sciænidæ* (q.v.), having perch-like form, convex head, with cellular bones, feeble anal spines, no barbels, long curved teeth or *canines* among the other teeth. A valuable species of this genus is the WEAKFISH, or SQUETEAGUE (*O. regalis*), common on the e. coasts of N. America, from the Gulf of Mexico to the Gulf of St. Lawrence, though appearing only in the warmer part of the year. It swims in shoals near the surface, takes bait greedily, and may be readily caught with any soft bait. It enters the mouths of rivers where the water is brackish. The flesh is pleasant, but soon becomes soft. Excellent isinglass is made of the air-bladder.—A number of species of O. are found in the E. Indian seas, some of which are valuable for the isinglass made from their air-bladder, and some are much used as food, both fresh and dried.

OTOLOGY, n. *ō-tŏl′ŏ-jĭ* [Gr. *ōta*, the ears; *logos*, discourse]: the part of anatomy which treats of the ear; a treatise on the ear.

OTOMIS, *o-to-mēz′*, or OTHOMIS′: one of the most ancient and most widely scattered Indian tribes in Mexico. Previous to the appearance of the Toltecs, by whom they were driven to the mountainous regions of the country, they were settled in the valley of Mexico. On the decline of the Toltec power they returned, but were afterward dislodged by the Aztecs. At a later period part of their territory was regained. They became partially civilized before the appearance of the Spaniards by whom they were conquered. Some of the bands accepted Christianity. They occupy the mountainous portions of the states of Querétaro, Hidalgo, and Guanajuato, and numerous bands are found in several other portions of the country. Their language is one of the most unpleasant of all Indian dialects, but many of the people converse in Spanish, and have become Mexican citizens. A grammar and dictionary was published 1767, and several small religious works in the native tongue have been issued.

OTOPTERIS, n. *ō-tŏp′tėr-ĭs* [Gr. *ōta*, the ears; *pteris*, a fern]: in *geol.*, a genus of fossil ferns, so called in allusion to their ear-shaped projections.

OTORRHŒA, n. *ŏt'tō-rē'ă* [Gr. *ōta*, the ears; *rhĕō*, I flow]: in *med.*, a flow or running of the ear; purulent or muco-purulent discharge from the external ear. It may be due to various causes, of which the most frequent is catarrhal inflammation of the lining membrane of the meatus, and the next in frequency is Otitis (q.v) in its various forms. If the discharge is very fetid, a weak solution of chloride of lime, or of Condy's Disinfectant Fluid, may be used, in place of the solution of sulphate of zinc (see OTITIS); and in obstinate catarrhal inflammation of the lining membrane, the discharge may often be checked by pencilling the whole interior of the meatus with a solution of five grains of nitrate of silver in an ounce of water.

OTOSCOPE, n. *ŏt'ō-skōp* [Gr. *ōta*, the ears; *skopĕō*, I see or observe]: in *med.*, an instr. for exploring the ear.

OTOSTEALS, n. *ō-tŏs'tĕ-ăls* [Gr. *ōta*, the ears; *ostĕŏn*, a bone]: a term applied to the bones of the ear.

OTRAN'TO (ancient *Hydruntum*): small town on the s.e. coast of the province of O., 24 m. s.e. of Lecce. During the latter period of the Roman empire, and through the middle ages, it was the chief port of Italy on the Adriatic, whence passengers took ship for Greece—in this respect supplanting the famous Brundusium of earlier times. In 1480, it was taken by the Turks, and at that time it was a flourishing city of 20,000 inhabitants; but it has long been decaying, principally on account of malaria. O. possesses a castle and a cathedral. Its harbor is unsafe. In clear weather, the coast of Albania is visible from Otranto. Pop. about 2,000.

OTRANTO, Duke of: see FOUCHÉ, JOSEPH.

OTRANTO, *ō-trân'tō*, TERRA DI, now called LECCE: extreme s.e. province of Italy, forming the heel of the 'Italian boot;' bounded n.w. by the provinces of Bari and Basilicata, and surrounded on all other sides by the sea; 102 m. long, 25 to 35 m. broad; 3,293 sq. m. It occupies the ancient Iapygian or Messapian peninsula. Three-fourths of its surface are covered with hills, offsets from the Apennines of Basilicata. All the rivers are short, many of them being lost in the marshes of the interior; but abundant springs and heavy dews render the soil surprisingly fertile. Good pasture lands and dense forests occur. The climate is pleasant and healthful, except along the e. and w. coasts and in the vicinity of the marshes, which in summer generate malaria. An abundance of the best wine, with corn and olive-oil, are produced; tobacco (the best grown in Italy), cotton, and figs, almonds, oranges, etc., also are produced. The cap. is Lecce (q.v.). Pop. of O. (1881) 553,298.

OTSEGO, *ŏt-sē′gō*, LAKE: in Otsego co., N. Y.; about 7½ m. long by 1½ m. wide, 1,193 ft. above sea-level, and forms the source of the principal branch of the Susquehanna river. It is noted for the beauty of its scenery, the clearness of its waters, and the abundance of fish which it contains. Small steamers ply upon it in summer. Cooperstown, cap. of the co., is at the s. extremity near the outlet of the lake. It is a favorite summer resort.

OTTAVARIMA, n. *ŏt-tâ-va-rē′ma* [It. eighth or octuple rhyme]: a form of versification consisting of eight lines, of which the first six rhyme alternately, and the last two form a couplet, the metre of the lines being eleven syllables.

OTTAWA, *ŏt′ta-wa:* capital and principal city of La-Salle co., Ill.; at the junction of the Fox and Illinois rivers, on the Chicago Rock Island and Pacific and the Chicago Burlington and Quincy railroads, and the Illinois and Michigan canals; 82 m. s.w. of Chicago. There are 12 churches; a high school; public library; 1 monthly, 1 semi-weekly, 7 weekly, and 2 daily newspapers; 2 national banks (cap. $200,000), and 1 private bank; and several hotels. There are a large number of artesian wells, a system of water-works has been established, there are street railways, a fire department is maintained, and light is furnished by gas and electricity. A mineral spring, whose waters are said to equal in medicinal properties those of the Saratoga Springs, is in the centre of a beautiful park and has wide celebrity. In the vicinity are large deposits of coal, fire-clay, kaolin, magnesium, fine white sand, and stone for building purposes. There is excellent water-power and extensive manufactures of glass, tile, fire-brick, machines, agricultural implements, wagons, refrigerators, and organs. There are large marble works, a foundry, box-factory, and other industries. Bailey's Falls, Deer Park Canon, and other scenic attractions are only a few miles distant. Pop. (1870) 7,736; (1880) 7,834; (1890) about 12,000.

OT′TAWA: city, cap. of Franklin co., Kan.; on the Missouri Pacific and Southern Kansas railroads, and on Marais des Cygnes river, 27 m. s. of Lawrence, 53 m. s. w. of Kansas City, Mo. It is the seat of Ottawa Univ.; has 1 monthly, 1 daily, and 5 weekly papers; 2 national banks (cap. $150,000), 1 state and 1 private bank. There are large flour-mills, castor-oil and linseed-oil mills, sorghum syrup works, furniture shops, a soap factory, foundry, and railroad machine and repair shops. There is large trade with the surrounding region. Pop. (1880) 4,032; (1885) 6,626; (1890) about 8,000.

OT′TAWA: city, cap. of the Dominion of Canada, 87 m. above the confluence of the Ottawa with the St. Lawrence, 126 m. from Montreal, 450 from New York. It is connected with the Grand Trunk railway, and on the line of the Canadian Pacific railway. Hull (pop. 7,000), on the opposite bank of the river, is incorporated with

O. and New Edinburgh, an eastern suburb, is the seat of the gov.gen. of Canada. The Rideau canal divides O.; and the business part of the town, with the chief public buildings, lies on its w. side. Originally called Bytown, after Col. By, who 1827 was commissioned to construct the Rideau canal, it was incorporated as a city, and received its present name 1854. At the w. end of the city, the Ottawa rushes over the magnificent cataract known as the Chaudière Falls; and at the n.e. end there are two other cataracts, over which the Rideau tumbles into the Ottawa. The scenery around O. is scarcely surpassed by any in Canada. The immense water-power at the city is used in several saw-mills, which give O. its principal trade, and issue almost incalculable quantities of sawn timber. A suspension bridge over the Chaudière Falls, connects Upper and Lower Canada. The city is in communication by steamer on the Ottawa with Montreal; on the Rideau canal with Lake Ontario at Kingston; and with the principal points of the province by the St. Lawrence and Ottawa and the Canada Central lines. In three years, 1879–81, the value of total exports varied from $1,115,000 to $2,380,000; imports from $890,000 to $1,360,000. In 1858 O. was chosen to be the seat of govt. of the then province of Canada; and 1860 the Prince of Wales laid the corner-stone of magnificent parliamentary offices—among the finest structures on the American continent. Pop. (1871) 21,545; (1881) 27,412.

OTTAWA, *ŏt′ta-wa*, **RIVER**: one of the large rivers of British N. America. It rises in lat. 48° 30′ n., long. 76° w., in the watershed on the opposite side of which rise the St. Maurice and Saguenay. After a course of more than 600 m., it falls into the St. Lawrence by two mouths, which form the island of Montreal: the entire region drained by it and its tributaries is estimated at 80,000 sq. m. In some places its width contracts to 125 or 150 ft.; elsewhere it widens into numerous lakes of considerable size. It is fed by many important tributaries, such as the Mattawa, Missinnippi, Madawasca, and Rideau on the right, the Gatineau and the Rivières du Moine and du Lièvre on the left side. These, with the O. itself, give transit for perhaps the largest lumber trade in the world, while the clearances of the lumberer have opened the country for several thriving agricultural settlements. The navigation has been greatly improved, especially for timber, by construction of dams and slides, to facilitate its passage over falls and rapids. The O. is connected with Lake Ontario at Kingston by the Rideau canal. Navigation might be made possible from the westward by connecting the O. with Georgian Bay in Lake Huron, through the French river, Lake Nipissing, and the Mattawa—materially decreasing the distance between the east and west.—The O. possesses one of the few literary associations of Canada. At St. Ann's, a few miles above its mouth, the house is pointed out where Thomas Moore wrote the Canadian boat-song

OTTAWAS, *ŏt'ta-waz:* one of the tribes of American Indians of the Algonquin stock. When the French first explored the region, the O. were settled on the n.w. portion of Mich. and on the Manitoulin islands. There were three divisions of the tribe, the Kiskakons, Sinagos, and Keinouches. They worshiped three gods, Michabou, the creator of the earth; Missabizi, 'the great tiger;' and Mirabichi, god of the waters. After the power of the Hurons was destroyed by the Iroquois 1649, that portion of the tribe living at Saginaw, Thunder Bay, and on the Manitoulin islands joined the Sioux in their home beyond the Mississippi. They soon quarrelled with the Sioux, whom they left, and settled at Mackinaw. Here they had trouble with the Iroquois, and allied themselves with the French. When Detroit was settled, part of the O. located in the vicinity and the Mackinaw settlement was removed to Arbre Croche. In the struggle for the possession of Canada the tribe aided the French; and at its close Pontiac, chief of the Detroit portion, conspired to massacre the English garrisons and destroy the English power in all that region (see PONTIAC). The Arbre Croche branch did not take part in this outrage. The O. were allies of the English in the revolution. By various treaties they have ceded lands to the United States. They divided into several bands and mingled with other tribes. One of the branches settled in Kan., and its members became citizens, but removed 1870 to a reservation in the Indian Terr. where 1885 they owned 14,860 acres of land. Their number had become reduced to 115. The Michigan O. have reservations in that state, near the Chippewas, and are civilized and industrious. The Canadian O. are located on various islands, and are peaceful and prosperous.

OTTENDORFER, *ŏt'tĕn-dorf-ėr*, OSWALD: born Zwittau, Moravia, 1826, Feb. 26. After obtaining a classical education, he studied law at the University of Vienna, engaged in an uprising against the govt., fled to Saxony and took part in another attempt at revolution; came to New York, where he was engaged in the business dept. of the *Staats-Zeitung*, and 1859 married Mrs. Uhl, widow of the former proprietor. Under his management the paper greatly increased in circulation and influence. It has favored civil-service reform and advocated various improvements in the management of public schools. O. was an alderman 1872–74, and in the latter year was the anti-Tammany candidate for mayor, and was defeated. He gave $300,000 to establish and maintain a school in his native town, established a free library in New York, and at a cost of about $600,000 built the New Isabella Heimath, a home for aged indigent women, opened 1889, Nov., at 190th st. and Tenth avenue, New York.

OTTER, n. *ŏt′tėr* [Ger. *otter;* Icel. *ottr*, an otter: F. *loutre*—from L. *lutra*, an otter], (*Lutra*): genus of quadrupeds of the Weasel family (*Mustelidæ*), differing widely from the rest of the family in their aquatic habits and in a conformation adapted to these habits, and in some respects approaching that of seals. The body, long and flexible, as in the other *Mustelidæ*, is considerably flattened; the head is broad and flat; the eyes are small, and furnished with a *nictitating membrane;* the ears are very small; the legs are short and powerful; the feet, which have each five toes, are completely webbed; the claws are not retractile; the tail is stout and muscular at its base, long, tapering, and horizontally flattened; the dentition is very similar to that of weasels; six incisors and two canine teeth in each jaw, with five molars on each side in the upper, and five or six in the lower jaw; the teeth very strong, and the tubercles of the molars very pointed, an evident adaptation for seizing and holding slippery prey. The tongue is rough, but not so much so as in the weasels. The fur is very smooth, and consists of two kinds of hair—an inner fur very dense and soft, intermixed with longer, coarser, and glossy hair. The species are numerous, both in warm and in cold climates.—The COMMON O. (*L. vulgaris*) is a well-known British animal, common also throughout Europe and in parts of Asia. It often attains a weight of 20 to 24 lbs. The size varies much, but the average length is fully 2 ft., exclusive of the tail, which is about 16 inches long. The color is a bright rich brown on the upper parts and the outside of the legs, being the color of the tips of the long hairs, which are gray at the base; the tips of the hairs in the soft inner fur also are brown, the base is whitish-gray; the throat, cheeks, breast, belly, and inner parts of the legs are brownish-gray, sometimes whitish; and individuals sometimes, but rarely, occur with whitish spots over the whole body; the whiskers are very thick and strong; the eyes are black. The O. frequents rivers and lakes, inhabiting some hole in their banks, generally choosing one which already exists, and seldom, if ever, burrowing for itself. It also inhabits the sea-shore in many places, and swims to a considerable distance from the shore in pursuit of prey. Its movements in the water are extremely graceful; it swims with great rapidity in a nearly horizontal position, and turns and dives with wonderful agility. Its prey consists chiefly of fish, and, like the other *Mustelidæ*, it seems to take pleasure in pursuing and killing far more than it is able to eat; and in this case it daintily feeds on the choicest part, beginning behind the head of the fish, and leaving the head and often much of the tail part. The O., however, when fish cannot readily be obtained, satisfies the cravings of hunger with other food, even snails and worms, and attacks small animals of any kind, sometimes making depredations in places far from any considerable stream. The O. produces two to five young ones at a birth. The flesh of the O. has a rank fishy taste, on which account, perhaps, it is sometimes used in the Rom. Cath. Church, as *fish*, by those whose rules forbid them the use of flesh.—O. hunting has long been practiced in Britain, though now confined chiefly to Wales and Scotland. Hounds of a particular breed—O. Hounds—are preferred for it.—The O. defends itself with great vigor against assailants. It can be easily domesticated, and trained to catch fish for its master. In India, tame otters—probably, however, of another species (noticed below)—are frequently used both for catching fish, which they bring ashore in their teeth, and for driving shoals of fish into nets.—The fur of the O. is in some request, but more on the continent of Europe than in Britain.—The AMERICAN O. or CANADA O. (*L. Canadensis*) is very like the Common O., but considerably larger. The tail is shorter, and the fur of the belly is almost of the same shining brown color with that of the back. This species is plentiful in the n. parts of N. America. Its skin is a considerable article of commerce, and after being imported into England, is often exported again to the continent of Europe. It is usually taken by a steel-trap, placed at the mouth of its burrow, and its pursuit forms a systematic occupation. Its habits are very similar to those of the O. of Europe.—The INDIAN O. (*L. Nair*), has a deep chestnut-colored fur, and yellowish-white spots above the eyes. —The Brazilian O. (*L. Braziliensis*) is said to be gregarious.—Somewhat different from the true otters is the SEA O. or KALAN (*L. marina*, or *Enhydra lutris*), an animal twice the size of the Common O., native of Behring's Straits and the neighboring regions, frequenting sea-washed rocks. There are, at least in the adult, only four incisors in the lower jaw, and the ears are set lower in the head than in the true otters, below, not above, the eyes. The tail is much shorter. The molar teeth are broad, and well adapted for breaking the shells of mollusks and crustaceans. The hind-feet have a membrane skirting the outside of the exterior toes. The sea O. is much valued for its fur, the general hue of which is a

Otter (*Lutra vulgaris*).

rich black, tinged with brown above, and passing into lighter colors below. The head is sometimes almost white. The skins of sea otters were formerly in very great request in China, so that a price of $175 to $250 could be obtained for each; but the attention of European traders and hunters having been directed to them—chiefly by a passage in *Cook's Voyages*—they were carried to China in such numbers as greatly to reduce the price.

OTTERBEIN, *ŏt'ėr-bīn*, Philip William: founder of the Church of the United Brethren in Christ: 1726, June 3—1813, Nov. 17; b. at Dillenburg, in Nassau, Germany; of a family noted for producing a large number of ministers and teachers. He was educated at the Ger. Reformed Acad. at Herborn—the course of study comprising Greek, Latin, Hebrew, philosophy, and theology; and afterward he was four years a teacher in the same school. He was ordained in the Ger. Reformed Chh., at Dillenburg, 1749, June 13; and 1752 he was sent as missionary to his countrymen who had settled in America, responding to a call from the Rev. Michael Schlatter, the pioneer laborer among the German Reformed in America, who was acting under the direction of the synods of N. and S. Holland. O. served successively congregations at Lancaster, Penn., Tulpehocken, Penn., Frederick, Md., York, Penn., and Baltimore, Md. During his Lancaster ministry, he reached a marked and new evangelical experience; and from that time his preaching had new fervor and power. His introduction of prayer meetings, his training laymen to conduct meetings, his zeal and 'new measures,' excited much opposition among the conservative members of the Ger. Reformed Church. About 1766 he met at a 'great meeting' the Rev. Martin Boehm, a devout Mennonite, whose religious experience was similar to his own. After listening to a fervent sermon by Mr. Boehm, O. arose and clasped him in his arms, exclaiming, with manifest emotion, 'We are brethren.' In 1774 O. went to Baltimore and became pastor of an independent congregation, laboring there with great success till his death. His labors as an evangelist among the Germans during his later years were fruitful in a large degree. He was an intimate friend of the Rev. Francis Asbury (q.v.), and was chosen to assist in his ordination as bishop.

O., though never formally severing his connection with the church into whose ministry he had been ordained, and though reluctant to organize his followers into a separate denomination, yet finding that the circumstances required organization to perpetuate the great work of his life, joined with Martin Boehm in calling a conference 1800, Sep. 25, at which he and Mr. Boehm were chosen bishops. In scholarship, broad sympathy with his fellow-men, and fervent piety, he was well qualified to be the founder of the great religious movement with which his name is so honorably associated. See United Brethren in Christ.

OT'TERBEIN UNIVER'SITY: institution of learning at Westerville, O.; oldest and most noted educational institution of the Church of the United Brethren in Christ. It was founded 1847, and named in honor of Bp. Philip William Otterbein, founder of the church. The policy of co-education was adopted, and the school opened 1847, Sep. 1, under the presidency of W. R. Griffith; during the first year, it had 81 students. In 1849 the institution was regularly chartered, and the Rev. William Davis was elected pres., being succeeded, after one year, by the Rev. Lewis Davis, who served till 1857, when he resigned, to accept the bishop's office. After various presiding officers, H. A. Thompson, D.D., became pres., 1872–86; succeeded by Henry Garst, D.D., who resigned 1889. The same year the Hon. Charles A. Bowersox, an alumnus of the institution and a lawyer, was called to the president's chair. The original buildings consisted of a chapel and recitation-rooms, and a dormitory for young ladies. In 1854 a dormitory for young men was built, the funds for the building being contributed mostly by Mr. Jacob Saum. In 1855 a main building was erected, at a cost of $40,000. In 1870 this building, with all its contents, was destroyed by fire, involving a loss of $50,000. The following year the present commodious and well-appointed building, costing $45,000, was erected. The institution has an endowment of $100,000. There are 10 members in its faculty, with nearly 300 students. The aggregate attendance of students has been nearly 8,000 during its history, of whom 317 have been graduated. The university has a library of 5,000 vols. The courses of study leading to degrees conform to the standard of the Ohio College Assoc., requiring three years in preparation and four years in college work.

OT'TERBURN, Battle of: see Chevy Chase.

OTTO, *ŏt'ō*, Louis William, Count of Mosloy: 1754–1817, Nov. 9; b. Baden, Germany. He studied at the Univ. of Strasbourg, came to the United States 1779 in the diplomatic service of the French govt., and remained about three years. He sympathized with the Girondists 1793, and assisted the committee of public safety. On the overthrow of the party, he was imprisoned, but obtained his liberty on the fall of Robespierre. He was afterward in diplomatic service at Berlin, London, and Vienna; arranged the marriage of Napoleon with Maria Louisa, and was for a short time minister of state. His wife was an American lady named Livingston. He died at Paris.

OTTOMAN, a. *ŏt'tō-măn* [a name of the Turkish empire —from *Othman*, its founder]: term designating anything that pertains to the Turks or their government: N. kind of sofa; stool having a stuffed bottom; reclining or easy seat.

OTTOMAN EMPIRE, or 'EMPIRE OF THE OSMANLIS': empire comprehending all the countries more or less under the authority of the Turkish sultan; including, besides Turkey in Asia, and that part of Turkey in Europe under his immediate sovereignty, the tributary but autonomous principality of Bulgaria, with the autonomous province of Eastern Roumelia, in Europe (Roumania, Servia, and Montenegro being now independent); Egypt (nominally) and Tripoli, in Africa; and a part of Arabia, including Mecca and Medina, in Asia. For the description, topography, and statistics of TURKEY, see that title. Here is presented a sketch of the origin and history of the Ottoman Empire.

The Ottomans, or Osmanlis, to whom the generic epithet of *Turks* is by common usage now confined, are descendants of the Ogûzian Turks, a tribe of the great Turkish nation, which in the 13th c. inhabited the steppes e. of the Caspian Sea. The tide of Mongol invasion then setting in from the n.e., swept the Ogûzes before it, and they, to the number of 50,000, under their chief, Suliman, fled w. to the mountainous region of Armenia. After the chief's death, the majority of the tribe became scattered over Mesopotamia; but a few thousands under Orthoguel, his youngest son, marched westward to aid the Seljuk sultan of Konieh against the Khaurezmians and Mongols, and received from the grateful monarch a grant of land in Phrygia.—His son, OTHMAN (q.v.) (ruled 1289–1326), laid the foundation of the independent power of the Turks; and Othman's son and successor, ORKHAN (ruled 1326–59) continued his aggressive policy, and gained a footing in Europe by the taking of Gallipoli, Koiridicastron, and other fortresses on the coast. The Greeks, with the usual contempt of civilization for barbarism, made light of these losses, saying that the Turks had only taken from them a 'hog's sty' and a 'pottle of wine,' in allusion to the magazines and cellars built by Justinian at Gallipoli; but, as the historian Knolles quaintly remarks, 'by taking of such hogsties and pottles of wine, the Turks had gone so far into Thracia, that Amurath, a few years later, placed his royal seat at Adrianople.' Sultan Orkhan, perceiving the advantage of possessing a force trained exclusively for war, organized the body of troops known as Janizaries (q.v.), and to these his successor added the Spahis (q.v.) and the Zanis.—AMURATH I. (ruled 1359–90), successor of Orkhan, rapidly reduced the Byzantine empire within the limits of Constantinople and some neighboring districts in Thrace and Bulgaria. A formidable confederacy of the Slavonian tribes of the Upper Danube was formed against him, and supported by multitudes of warriors from Hungary and Italy, they advanced into Servia to give him battle; but their army, amounting, it is said, to 500,000 men, was defeated with dreadful slaughter at Kossova (1390); and though the sultan was assassinated on the eve of the battle, his son, BAJAZET I. (q.v.) (ruled 1390–1402), followed up this victory by ravaging Servia and Walachia. Moldavia also was overrun, and a second crusading army, under the king of Hungary, totally routed at Nicopolis (1396); but the defeat and capture of the sultan by Timur (q.v.), gave Constantinople respite for half a century, by raising up numerous claimants for the Turkish throne; and it was not till 1413 that Bajazet's youngest son, MOHAMMED I. (ruled 1413–22), established his claim to the sceptre. A war which broke out with the Venetian republic at this time produced the most disastrous consequences to the mercantile and maritime interests of the Turks, and internal disorders prevented any aggressions on their neighbors.—AMURATH II. (ruled 1422–50), a prince of considerable ability, completed the conquest of the Greek empire by reducing Macedonia and Greece Proper; and finding that the Hungarians had concluded a secret treaty of offense and defense with the Turkish sultan of Caramania against him, he attacked the Hungarians, but was defeated by Hunyady (q.v.), and compelled to retreat. Disheartened at his ill success, he resigned the throne; but receiving news of a formidable invasion by the army of the papal crusade, resumed the direction of affairs, and totally defeated the invaders, with whom were Hunyady (q.v.) and Scanderbeg (q.v.), at Varna (1444).—MOHAMMED II. (q.v.) (ruled 1450–81), sworn foe of Christianity, greatly enlarged the Turkish territories. It was he who stormed Constantinople 1453, and destroyed the last relic of the empire of the Cæsars.—His son, BAJAZET II. (ruled 1481–1512), extended his dominions to the present limits of the Turkish empire in Asia and Europe, including, however, also the country n. of the Black Sea, as far e. as the mouth of the Don, portions of Dalmatia, and Otranto in Italy. Bajazet was the first to feel the evil effects of the military organization of the Janizaries by Sultan Orkhan, but all his attempts at riddance of his formidable soldiery were unsuccessful. He attempted the invasion of Egypt, but was totally defeated by the Mameluke sultan at Arbela (1493).—His successors, SELIM I. (q.v.) (ruled 1512–20), and SOLYMAN I. (q.v.) (ruled 1520–66), raised the O. E. to the height of its power and splendor. During their reigns, no ship belonging to a nation hostile to the Turks dared navigate the Mediterranean, so completely did their fleets command that sea.—SELIM II. (ruled 1566–74), a pacific prince, put an end to a war with Austria, begun in the previous reign, by a peace in which it was stipulated that Emperor Maximilian II. should pay a tribute of 30,000 ducats annually for the possession of Hungary, and that each nation should retain its conquests. During his reign, occurred the first collision of the Turks with the Russians. It had occurred to Selim, that the connection of the Don and Volga by a canal would, by allowing the passage of ships from the Black Sea into the Caspian, be a valuable aid to both military and commercial enterprise; accordingly he sent 5,000 workmen to cut the canal, and an army of 80,000 men to aid and protect them. But, unluckily, the possession of Astrakhan formed part of the program, and the attack of this town brought down on the Turks the wrath of the Russians, a people till then unknown in s. Europe, and the projected canal-scheme was checked at the start. The rest of this sultan's reign was occupied in petty wars with Venice, Spain, and his rebellious feudatory of Moldavia.—His son, AMURATH III. (ruled 1574–95), such was then the prestige of the Turks, dictated to the Poles that they should choose as their king, Stephen Bathory, Woiwode of Transylvania; and received the first English embassy to Turkey 1589, the object of the embassy being to conclude an alliance against Philip II. of Spain. To this the sultan agreed; but the destruction of the Spanish Armada soon afterward rendered his interference unnecessary. After an exhausting, though successful war with Persia, succeeded a long contest with Austria, in which the Turks at first obtained brilliant success, penetrating to within 40 m. of Vienna, but afterward suffered such terrible reverses, that they were compelled to evacuate all Hungary and Transylvania (hitherto a feudatory), and were saved from destruction only by the Poles, who, entering Moldavia, and driving out the Transylvanians and Hungarians, afforded the Turks an opportunity of rallying, and even recovering some of their losses. The latter part of this war was during the reign of MOHAMMED III. (ruled 1595–1604), and afforded unmistakable symptoms of the decline of Turkish prowess; and a rebellion of the Pasha of Caramania, in Asia, quelled not as Mohammed II. or Bajazet I. would have quelled it, but by yielding to the pasha's demands, afforded convincing proof of the growing weakness of the central administration, and set an example to all ambitious subjects in future. During the reigns of ACHMET I. (ruled 1604–17), MUSTAFA (ruled 1617–17; 1622–3), OTHMAN II. (ruled 1617–22), and AMURATH IV. (ruled 1623–40), Turkey was convulsed by internal dissensions; nevertheless, a successful war was waged with Austria for possession of Hungary; but this success was more than counterbalanced in the East, where Shah Abbas the Great conquered Mesopotamia, Kurdistan, and Armenia; and in the north, where the Poles took possession of some frontier fortresses. While Amurath was recovering his lost provinces in the East, the khan of the Crimea, countenanced by the Poles and Russians, threw off his allegiance. Mustafa, grand vizier, a man of great ability and integrity, continued at the helm of government under IBRAHIM (ruled 1640–48); took from the Poles their conquests; and in a war with the Venetians (1645), obtained Candia and almost all the Venetian strongholds in the Ægean Sea, though with the loss of some towns in Dalmatia.—MOHAMMED IV. (ruled 1648–87) commenced his reign in most unfavorable circumstances; he was only seven years of age, and the whole power was vested in the Janizaries and their partisans, who used it to accomplish their own ends; but luckily for Turkey, an individual of obscure birth, Mohammed Köprili, supposed to be of French descent, was, when more than 70 years of age, appointed vizier; and the extraordinary talents of this man were the salvation of Turkey at this critical juncture. He was succeeded (1661) in office by his son Achmet, a man of equal ability, and under his guidance the central administration recovered its control over even the most distant provinces; a formidable war with Germany, though unsuccessful in the field (1663), was concluded by a peace advantageous to the Turks; Crete was wholly subdued, and Podolia wrested from the Poles; though, shortly afterward, much of this last acquisition was reconquered by John Sobieski (q.v.). Achmet's successor overran the Austrian territories, and laid siege to Vienna; but the siege was raised, and his army defeated, by a combined army under Duke Charles of Lorraine, and John Sobieski, King of Poland. The Austrians followed up this victory by repossessing themselves of Hungary, inflicting on the Turks a bloody defeat at Mohacz (1687); but the fortunate appointment of a third Köprili as grand vizier by SOLYMAN II. (ruled 1687–91), was the means of restoring glory and fortune to the Turkish arms.—The reigns of ACHMET II. (ruled 1691–95), and MUSTAFA II. (ruled 1695–1702), were occupied with wars against Austria; but with the death of Köprili (1691) fortune deserted the Turks, and the peace of Carlowitz (1699) forever put an end to Turkish domination in Hungary.—ACHMET III. (ruled 1702–30) was forced by the intrigues of Charles XII. (q.v.) of Sweden, while residing at Bender, into a war with Russia; which was immediately followed by an invasion of Moldavia by Czar Peter. The czar, imprudently relying on the aid of the Woiwode of Moldavia, found himself in great straits, from which he was rescued by the genius of his queen, afterward Catharine I. The recovery of the Morea from the Venetians, and the loss of Belgrade and parts of Servia and Walachia, which were, however, recovered during the subsequent reign of MAHMUD I. (ruled 1730–54), and the commencement of a long war with Persia (see NADIR SHAH), were the other prominent occurrences of Achmet's reign. In 1736, the career of Russian aggression commenced with the seizing of Azof, Oczakof, and other important fortresses; but a scheme for the partition of Turkey between Austria and Russia was foiled by the continued series of disgraceful defeats inflicted on the Austrian armies by the Turks: the Russians, on the other hand, were uniformly successful; but the czarina becoming very desirous of peace, resigned her conquests in Moldavia, and concluded a treaty at Belgrade. Among the benefits conferred by Sultan Mahmud on his subjects, not the least was the introduction of the art of printing.—His successor, OTHMAN III. (ruled 1754–57), soon gave place to MUSTAFA III. (ruled 1757–74), under whom the empire had profound tranquillity; but after his death, the Russians, in violation of the treaty of Belgrade, invaded Moldavia.—The war with Russia continued during the succeeding reign of ABDUL-HAMID (ruled 1774–89); the fortresses on the Danube fell; and the main army of the Turks was totally defeated at Shumla. The campaign was ended 1774, July 10, by the celebrated treaty of Kutshouk-Kainardji. In defiance of its provisions, the czarina took possession of the Crimea and the whole country eastward to the Caspian. The sultan was compelled, by his indignant subjects, to take up arms 1787. In 1788 Austria made another foolish attempt to arrange with Russia a partition of Turkey; but, as before, the Austrian forces were completely routed. The Russians, however, with their usual success, had overrun the n. provinces, taken all the principal fortresses, and captured or destroyed the Turkish fleet.—The accession of SELIM III. (q.v.) (ruled 1789-1807) was inaugurated by renewed vigor in the prosecution of the war; but the Austrians had again joined the Russians. Belgrade surrendered to the Austrians; while the Russians took Bucharest, Bender, Akerman, and Ismail (see SUVOROF); but the critical aspect of affairs in w. Europe made it advisable for Russia to terminate the war, and a treaty of peace was accordingly signed at Jassy, 1792, Jan. 9. By this treaty the provisions of that of Kainardji were confirmed; the Dniester was made the boundary-line, the cession of the Crimea and the Kuban was confirmed, and Belgrade was restored to the sultan. Numberless reforms were then projected for better administration of the empire. The people were, however, unprepared for so many changes, and the sultan's projects cost him his throne and life. The occupation of Egypt by the French brought on a war between them and the Turks, in which the Turks, by aid of the British, were successful in regaining their lost territories. In revenge for the defeat of his Egyptian expedition, Napoleon contrived to entrap the sultan into a war with Russia and Britian, which was confined to a struggle in Egypt, in which the British were worsted.—After the ephemeral reign of MUSTAFA IV. (ruled 1807–8), the able and energetic MAHMUD II. (q.v.) (ruled 1808–39) ascended the throne; and though his dominions were curtailed by the loss of Greece, which established its independence, and of the country between the Dniester and the Pruth, which, by the treaty of Bucharest in 1812, was surrendered to Russia, the reformation that he effected in all departments of administration checked the decline of the O. E. Egypt, during his reign, attempted unsuccessfully to throw off the authority of the sultan (see MEHEMET ALI: IBRAHIM PASHA).—His son, ABDUL-MEDJID (ruled 1839–61), continued the reforms commenced in the previous reign; but the czar, thinking that the dissolution of the O. E. was at hand, constantly tried to wring from the sultan some acknowledgement of a right of interference with the internal affairs of the country. It was an attempt of this sort to obtain the exclusive protectorate of the members of the Greek Church in Turkey, that brought on the Crimean war of 1853–55, in which the Turks were effectively supported by England, France, and Sardinia. The treaty of Paris (1856) restored to Turkey the command of both sides of the lower Danube, excluded the czar from his assumed protectorate over the Danubian principalities, and closed the Black Sea against all ships of war. The Porte, apparently adopted into the family of European nations, made proclamation of equal civil rights to all the races and creeds of the Turkish dominions. But a massacre of Christians in Lebanon and at Damascus provoked western intervention 1860.—Abdul-Medjid, whose last years were disgraced by irrational profuseness of expenditure, was succeeded by his brother ABDUL-AZIZ 1861. Meanwhile the nominally subject peoples of Moldavia and Walachia ventured to unite themselves into the one state of Roumania; and 1866, the Empire, becoming more and more enfeebled through its corrupt administration, had to look on while the Roumanians expelled their ruler, and, in the hope of securing western support, chose Prince Charles of Hohenzollern hereditary prince (*domnu*) of the united principalities. The rebellion of Crete 1866 threatened a severe blow to the integrity of the empire, but was ultimately suppressed 1868—in spite of active help from Greece. Servia, already autonomous within her own frontiers, demanded the removal of the Turkish garrisons still maintained in certain Servian fortresses; and 1867 Turkey found herself compelled to make this concession. In the same year the sultan distinguished the Vali of Egypt by granting him the unique title of Khedive (q.v.). The vassal king drew down the wrath of his suzerain 1870 by negotiating directly with foreign courts, and was compelled to give formal tokens of vassalage. But later concessions have made the Khedive virtually an independent sovereign. The Russian govt. took the opportunity of war between Germany and France to declare, 1871, that it felt itself no longer bound by that provision of the Paris treaty which forbade Russia to have a fleet in the Black Sea; and a London conference sanctioned this stroke of Russian diplomacy. Between 1854 and 71 the Turkish debt had increased by more than $563,000,000; and 1875 the Porte was driven to partial repudiation of its debts. An insurrection in Herzegovina in the latter part of 1874 marked the beginning of a very eventful and critical period in the history of the O. E. The insurrection smouldered on through 1875 and part of 1876, and excited all the neighboring Slavonic peoples. A threatened revolt in Bulgaria 1875, May, was repressed with much bloodshed; and the merciless cruelty displayed by the Bashi-Bazouks or Turkish irregulars alienated foreign sympathy from the government.—1875, May, Abdul-Aziz was deposed; and his nephew, MURAD V., son of Abdul-Medjid, who succeeded him, was compelled in turn to make way for his brother ABDUL-HAMID II. in Aug. of the same year. In June Servia declared war, and Montenegro followed her example. Before the end of the year the Servians were utterly defeated, in spite of the help of many Russian volunteers; but the state of affairs in the Turkish provinces seemed to call for a conference of the great powers at Constantinople. The proposals then made for the better government of the Christian subjects of Turkey were rejected by the Turkish authorities, who had, during the conference, taken the extraordinary step of bestowing a parliamentary constitution on the O. E. Russia took upon herself to enforce on Turkey the suggestions of the conference, and declared war, 1877, Apr. 24. Both in Armenia and in Bulgaria the opening of the campaign was favorable to Russian arms; but later the Turks rallied and seriously checked the hitherto triumphant progress of the invaders. Even after the Russian forces had been greatly augmented, the Turks resisted energetically. Kars, besieged for several months, resisted till the middle of Nov; Erzeroum did not surrender until after the armistice had been concluded. Osman Pasha, who established himself in Plevna early in July, repelled with brilliant success repeated and determined assaults from a besieging army of Russians and Roumanians; and he so strengthened the fortifications as to be able to hold out until Dec. 10 , when he surrendered. Desperate fighting in the Shipka Pass had failed to expel the Russians from their position in the Balkans; and within a month of the fall of Plevna, the Russians captured the whole Turkish army guarding the Shipka Pass, and then easily overran Roumelia. The victorious Muscovites occupied Adrianople 1878, Jan., in menacing proximity to Constantinople; on the last day of that month an armistice was concluded; and in March the 'preliminary treaty' of San Stefano was signed. After grave diplomatic difficulties, owing chiefly to the apparent incompatibility of English and Russian interests, a congress of the powers met at Berlin, and sanctioned the cessions and other territorial changes which, with modifications, were carried out 1878–81. For these and later events, see TURKEY.

OTTO OF ROSES, *ŏt'tō*, correctly AT'TAR (q.v.): the volatile oil or otto (see PERFUMERY) of the petals of some species of rose, obtained by distillation, and highly prized as perfume. It is a nearly colorless or light yellow crystalline solid, at temperatures below 80° F., liquefying a little above that temperature. It is imported from the East, where in Syria, Persia, India, and Turkey, roses are cultivated to a considerable extent for its sake. It is probable that the oriental O. is the product of more than one species of rose; and it is uncertain what species is cultivated in some of the localities most famed for it; but *Rosa Damascena* is known to be so employed in n. India, and a kind of O. is sometimes obtained by the makers of rose-water from *Rosa centifolia* in England: see ROSE. Ghazipore, near Benares, is famous for its rose-gardens, which surround the town, and are in reality fields occupied by rows of low rose-bushes, which in the flowering season are red with blossoms in the morning, but the blossoms all are gathered before midday. Cashmere is noted for extensive manufacture of O., as are also the neighborhoods of Shiraz and Damascus. To procure the O., the rose-petals are usually distilled with about twice their weight of water, and the product exposed to the cool night-air in open vessels, from which the thin film of O. is skimmed with a feather in the morning. 20,000 flowers are required to yield O. equal to the weight of one rupee, which even in India is worth about 100 rupees, or about $50. O. is said to have been procured first by an accidental distillation of rose-petals exposed with water to the heat of the sun, and to have been found floating on the surface of the water; and it is still sometimes so obtained in India. It is said to be obtained also by dry distillation of rose-petals at a low temperature. During the distillation of rose-petals, a small quantity of a solid volatile oil comes over (Solid Oil of Roses, see below), which crystallizes and floats on the water in the receiver, and which is sometimes called *English Oil of Roses*. O. is frequently adulterated with sandalwood oil, oil of rhodium, etc. It is much used for making hair-oil, a drop of it imparting a pleasant odor to a considerable quantity. It is used also in making lavender-water and other perfumes. The odor of O. itself is too powerful to be altogether pleasant. For another method of obtaining the *scent* of roses, see PERFUMERY. O. is a mixture of two volatile or essential oils; the one solid at ordinary temperatures, and the other liquid. The solid oil of roses (rose camphor, stéaroptène of oil of roses) has very little odor. The liquid oil of roses (eléoptène of oil of roses) is a very fragrant liquid. The O. may be regarded as a solution of one part of the solid oil in two parts of the liquid. A good receipt for oil for the hair is olive oil, scented by a few drops of O., and this is generally sold under the name otto of roses. Medicines are occasionally perfumed by O., and it is sometimes added to unguents and spirit-washes.

OTTUMWA, *ŏt-tŭm'wa:* city, cap. of Wapello co., Io.; on the Des Moines river, and on the Chicago Burlington and Quincy, the Keokuk and Des Moines branch of the Chicago Rock Island and Pacific, the Kansas City branch of the Chicago Milwaukee and St. Paul, the Ottumwa and Kirkville, and the Wabash railroads, 75 m. n.w. of Burlington. The first settlement was on the banks of the river, but with the growth of the city the bluffs upon each side, 150 ft. in height, have been utilized for building sites. There are 15 churches; 6 public-school buildings which cost $180,000, a normal school, business college, and a Rom. Cath. acad.; 2 daily and 6 weekly papers; 3 national banks (cap. $260,000), and 2 state banks (cap. $100,000); 2 opera-houses; and 6 hotels. The city extends about 3 m. along the river, has 25 m. of sidewalks; 2 m. of paved and 7 m. of graded streets; a fine system of water-works; 5 m. of sewers; a steam heating plant; several miles of electric railroad; gas and electric lights; fire department; and excellent telephone service. Bricks are made in the vicinity, and fine qualities of limestone and sandstone for building purposes abound. Vast quantities of coal are found, and the river furnishes a fine water-power—claimed to be the best in the state. Pork-packing is conducted on an extensive scale. There are 2 foundries; a sewing-machine ruffler factory; 2 furniture shops; wagon and carriage-shops; a steam-plow factory; linseed-oil, starch, and flour mills; planing-mills; barrel factories and machine-shops; with various other industries; employing 3,000 people and $1,500,000 capital. The municipal assessment 1889 was $3,500,000. A 'coal palace' 230 ft. long by 130 ft. wide and a tower 200 ft. high, built of coal and costing about $30,000, was erected 1890 as an agricultural, mechanical, and industrial exhibition building. O. was settled about 1843 and was incorporated as a city 1857. Pop. (1870) 5,214; (1880) 9,004; (1890) about 16,000.

OTWAY, *ŏt'wā*, THOMAS: English dramatist: 1651, Mar. 3—1685, Apr. 14; b. Trotton, near Medhurst, Sussex; son of the rector of the church in the adjoining village. He left Oxford without taking a degree, and went to London in search of fortune in 1671. He appeared on the stage, but made a signal failure; and next he applied himself to dramatic composition. In 1675, *Alcibiades*, his first tragedy, was printed; and in the following year he produced *Don Carlos*, a rhymed tragedy, puerile but full of vigorous declamation which made it extremely popular, so that it 'got more money than any preceding modern tragedy.' His first comedy, *Friendship in Fashion*, appeared 1678, and, being sufficiently immoral to please the taste of the age, met general appreciation. In 1677 O. received a cornet's commission in a regiment, which, however, was disbanded 1678, and O. resuming his former occupation, produced the tragedy *Caius Marius* (confessed plagiarism from *Romeo and Juliet*) 1680. In the same year *The Or-*

phan met an extraordinary, and, in some respects, a deserved measure of success, though its moral standard would now be found far too low. In 1681, *The Soldier of Fortune* appeared; and in the following year, the finest of all his plays, *Venice Preserved*, was produced—a masterpiece of dramatic pathos. From this time till his death, the poet had much to endure from poverty and neglect. Debts accumulating upon him, he retired to an obscure public-house on Tower Hill, to avoid his creditors; and here, at the premature age of 34, he died in desolateness and want. Although O. achieved a brilliant reputation during his lifetime, although he is described by Dryden—and truly—as possessing a power of moving the passions which he himself did not possess, and later by Sir Walter Scott as being Shakespeare's equal, if not his superior, in depicting the power of affection; yet his plots are artificial, and his language is without fancy, melody, or polish. Unexcelled, perhaps even unequalled in the pathos of the situations which he depicts and in power to move the feelings thereby, he lacks the pathos which pertains to personality and character; while aside from the pathetic his work is mediocre.

OUBLIETTE, n. *ô-blĭ-ĕt′* [F. *oublier;* L. *obliviscor*, to forget]: a dungeon constructed in some old castles and buildings, in which were confined persons condemned to perpetual imprisonment or to secret death. A spiral staircase from the ground floor of the castle descended into a vaulted chamber, in the centre of the floor of which was an opening into the dungeon, this opening being not only the entrance into it, but the only means for the admission of air and light. These dungeons often extended below the bottom of the moat which surrounded the castle.

OUCH, n. *owch* [OF. *nouche*, a buckle, a clasp: OHG. *nusca*, a buckle: OE. *owche* or *nouche*, a jewel: mid. L. *nusca*, a brooch; *oscleium*, a wedding-gift, a jewel-case]: the collet or socket in which a precious stone or a seal is set; in *OE.*, a jewel.

OUDE, or OUDH, *owd:* province of British India, separated on the n. from Nepaul by the lower ranges of the Himalaya, whence it gradually slopes to the Ganges; extreme length, 270 m.; breadth, 160; 23,992 sq. m. Formerly an independent chief commissionership, it is now administered by the lieut. gov. of the N. W. Provinces. O. is one great plain, sloping from n.w. to s.e. Its chief rivers are the Gumti, the Ghagra (Ghogra), and the Rapti, which swarm with alligators. The n. part, on the edge of the Himalaya, is not very well known. It forms a portion of the Terai, a vast unhealthful tract stretching along the borders of Nepaul, and covered with impassable forests. The climate of O. is cool and pleasant from Nov. to Mar.; during the next four months it is hot and sultry, after which follows the long rainy season, but in general it is considered the most healthful along the whole valley of the Ganges. The soil is light, and except small nodules of chalk and oolite called *kankars*, there is hardly a loose stone to be seen. O. was formerly more copiously watered than now, the clearing of the jungles having greatly decreased the moisture of the land. The chief crops are wheat, barley, gram, masure, mustard, rice (of the finest quality), millet, maize, joar, bajra, various kinds of pulse and oil-seeds, sugar-cane, tobacco, indigo, hemp, and cotton. The manufacturing industry of O. is not important; soda, saltpetre, and salt are the only articles of which more is produced than is requisite for home-consumption. Gunpowder, and all kinds of military weapons, guns, swords, spears, shields, and bows of bamboo, or Lucknow steel, are, however, also made, besides some woolen goods, paper, etc. Bridges are few, if any, and the roads in general bad. The principal is the famous military road from Cawnpore n.e. to Lucknow. The people are of warlike disposition. The bulk of the inhabitants are Hindus, though the dominant race for centuries has been Mohammedan. The Brahmans are the most numerous class, but there are 29 different Rajput tribes. These two classes mainly supplied the mutinous sepoys of the Bengal army. The language spoken is Hindustani.

The most characteristic feature in the social economy of O. is its *village-system*, for a description of which see INDIA. The *ryots*, or cultivators of the soil, cling with extraordinary affection to the land which their fathers have tilled for ages, and thoroughly believe that they have a right of property in it; and, in general, we believe that they are *actually* the owners of their farms, but in many cases they have been dispossessed by a class of tax-gatherers (resembling the Roman *publicani*) called *talukdars*, who farmed from the Mogul, and afterward from the king of O., the revenues of a collection of villages called a *talukah*, and by their extortions so impoverished the ryots, or peasant-proprietors, that the latter were often forced to execute deeds transferring their property to the talukdars. Many of the more spirited would not submit to become *tenants*, and taking to the jungles, waged war on the new occupants of their ancestral lands, until gradually they sank into *dacoits*, or professional robbers. The extortions of the talukdars continued till the annexation of the country 1856, and the country suffered severely from the retaliatory raids of the dispossessed ryots. The E. India Company reinstated the ryots in their property, where the talukdars could not show undisputed possession for 12 years —a proceeding which gave great offense to the latter, who, in consequence, assumed a coldly hostile attitude to the British during the great mutiny of the following year.

The principal towns are Lucknow (q.v.), Fyzabad, Oude, or Ayodha, Roy Bareily, and Shahabad.

O. is believed, by Sanskrit scholars, to be the anc.

Kosala, oldest seat of civilization in India. The country was conquered by a Mohammedan army 1195, and made a province of the Mogul empire. In 1753 the vizier of O., Saffdar Jung, rebelled against his imperial master, Ahmed Shah, and forced the latter to make the governorship hereditary in his family. His son, Sujah-ud-Dowlah, became entirely independent, and founded a dynasty which ruled the country, generally in a most deplorable manner; until, in the interests of the wretched inhabitants, the E. India Company was obliged to adopt the extreme measure of annexation 1856, Feb. 7. The necessity for this high-handed but most beneficent act will be better understood if we read the statistics of crime in O. during the last years of its independence: one item will suffice: 1848–54, there were, on an average, no fewer than 78 villages burned and plundered every year, while murders, robberies, abductions, and extortions were daily occurrences. A feeble king, a blackguard soldiery, and a lawless peasantry had brought about a helpless and ruinous anarchy. When the mutiny of 1857 broke out, O. became one of the great centres of rebellion. Upon this, the confiscation of all the estates of the talukdars was proclaimed by Lord Canning; but when the country was subdued by British arms, the estates of all such as laid down their arms and swore fealty to the British govt. were restored. The forts of the petty chiefs, however, were dismantled, and the inhabitants disarmed. The province is now administered by a chief commissioner. The chief feature of the present condition of affairs in O. is the preservation in their integrity of the estates of the talukdars. The amount of govt. revenue paid by the talukdars is about £1,000,000.—Pop. (1869) 11,220,232; (1881) 11,387,741, about 475 to the sq. m.—probably the most dense rural pop. in the world.

OUDENARDE, *ow-dėn-âr′dėh:* town in the province of E. Flanders, Belgium; chiefly on the e. bank of the Scheldt, 16 m. s. by e. from Ghent. It has a fine Gothic council-house, important manufactures of linen and cotton fabrics, and many extensive tanneries. The town was taken by the French, aided by an English force, 1658; it was besieged 1674, by the stadtholder, William (III. of England) of Orange; and 1706 it was taken by Marlborough. An attempt by the French to retake it, brought on the famous battle of Oudenarde, one of Marlborough's most celebrated victories, gained 1708, July 11, with the aid of Prince Eugene, over a French army under the Duke of Burgundy and Marshal Villars. After this battle, the French king made offers of peace, which were not accepted.

OUDENODON, n. *û-dĕn′ō-dòn* [Gr. *ouden*, none; *odous* or *odonta*, a tooth]: in *geol.*, a subgenus of very peculiar fossil reptiles found in the sandstone of south Africa, so called from their toothless jaws.

OUDH, or **Oude**, or **Awadh**: one of the principal towns of the province Oude (q.v.); amid ruins on a hilly site on the right bank of the Sarayû or Goggra river, 80 m. e. of Lucknow. It is called also *Hanumangâ′dhi*, on account of a temple erected there in honor of Hanuman (q.v.), the fabled monkey-ally of Râma, an incarnation of the god Vish′nu. The name O. is a corruption of the Sanskrit *Ayodhyâ* (from *a*, not, and *yodhya*, conquerable, hence 'the invincible' city); but the ancient city of that name was situated opposite the modern O., where its ruins may still be seen. Ayodhyâ was one of the oldest seats of civilization in India; it was the residence of the solar dynasty, or one of the two oldest dynasties of India, deriving its descent from the sun; but it obtained special renown through Râma, son of Das′aratha, a king of that dynasty. Its great beauty and immense size are dwelt on in several of the Purânas and modern poems, especially in the *Râmâyan′a* (q.v.), the first and last books of which contain a description of it. According to some Purânas (q.v.), Ayodhyâ was one of the seven sacred cities, the living at which was supposed to free a man from all sin, and the dying at which, to secure eternal bliss. It was called also Sâketa, Kos′alâ, and Uttara-kos′alâ. See Goldstücker's *Sanskrit Dictionary*, under Ayodhyâ.

OUDINOT, *ô-de-nō′*, **Charles Nicolas**, Duke of Reggio, Marshal of France: 1767, Apr. 25—1847, Sep. 13; b. Bar-le-Duc, dept. of Meuse, France. At the age of 17, he entered the army, but returned home after three years' service. Having distinguished himself 1790 by suppressing a popular insurrection in his native district, he was, after some volunteer service, 1793, Nov., raised to the rank of chief of brigade, in the fourth regt. of the line, and distinguished himself in various actions with the Prussians and Austrians. He was wounded and taken prisoner before Mannheim, by the Austrians, but was soon exchanged, and served in the armies of the Rhine under Moreau, and in that of Switzerland under Massena. He was promoted gen. of division 1799, Apr. 12; and for a daring capture of a battery at Pozzola, was presented by the first consul with a sabre of honor and the cannon which he had taken. In 1805 he received the grand cross of the Legion of Honor, and about the same time received command of ten battalions of the reserve, afterward known as the 'grenadiers Oudinot.' At the head of this corps, he did good service in the Austrian campaign. He was present at Austerlitz and Jena, and gained the battle of Ostrolinka, 1807, Feb. 16, for which he was rewarded with the title Count, and a large sum of money. He greatly contributed to the success of the French at Friedland, and was presented by Napoleon to Czar Alexander as the 'Bayard of the French army, the knight *sans peur et sans reproche.*' He sustained his brilliant reputation in the second Austrian campaign of 1809, and July 12 was created Marshal of France, and Aug. 15, Duke of Reggio. In 1810 he was charged with the occupation of Holland, and by his unswerving probity and attractive personal qualities, drew the esteem of all classes. He was engaged in the disastrous Russian campaign, and subsequently took part in the various battles of 1813 between the French and the Russians and Austrians, being defeated at Gros Beeren. He was one of the last to abandon Napoleon, but he did so for ever, and spent the 'Hundred Days' on his own estates. At the second restoration he became a minister of state, commander-in-chief of the royal guard and of the national guard, and was created a peer of France, grand cross of St. Louis, etc. In 1823 he commanded the first division of the army of Spain, and was for some time gov. of Madrid. After the revolution of 1830, July, O. retired to his estates, and only at rare intervals presented himself in the chamber of peers. He became grand chancellor of the Legion of Honor 1839, May, succeeded Marshal Moncey as gov. of the Invalides 1842, Oct.; and died at Paris 1847. A statue was erected in his honor at Bar, 1850, Sep. 29.—His son, CHARLES NICOLAS-VICTOR OUDINOT, Duke of Reggio (1791–1863), was a distinguished gen. in the French army, commander-in-chief of the army of the Alps; and 1849, gen. of the French expedition against Rome, which forced the city to surrender. He was, however, not a Napoleonist. O. wrote several books on military matters.

OUGHT, v. *awt* [see AUGHT and OWE]: a defective verb, formerly the pt. of *owe;* to be bound in duty or moral obligation: N. anything.

OUGRÉE, *ô-grā´:* town of Belgium, three m. from Liége, on the Meuse. It has iron-works, a cannon-foundry, and oil and flour mills. Pop. 7,000.

OUIDA, *ô-ē´da* (child's mispronunciation of Louisa): pseudonym of Louisa de la Ramée, English novelist: b. Bury St. Edmunds 1840. Her early years were spent in London, but she soon made her home in the neighborhood of Florence. While very young, she contributed a novel to Colburn's *New Monthly:* it was published 1863 under the title *Held in Bondage;* and was followed in rapid succession by a long series of novels, including *Strathmore* (1865); *Chandos* (1866); *Idalia* (1867); *Under Two Flags* (1868); *Puck* (1869); *Folle Farine* (1871); *Pascarel* (1873); *Ariadne* (1877); *Moths* (1880); *Wanda* (1883); and *Princess Napraxine* (1884). O.'s merits and defects as a novelist, perhaps equally conspicuous, are strangely commingled. She has the faculty of vivid and forcible presentation, skilfully handles her materials, and shows true sympathy with many aspects of life. But her style is fantastic, aiming at gorgeous and glittering effects, and is overladen with pedantic and often amazingly inaccurate classical and cosmopolitan allusions; the pathos is overstrained and unnatural; the moral atmosphere is unreal and in not a few cases unwholesome.

OUIS′TITI: see MARMOSET.

OU′LACHAN: see CANDLE-FISH.

OULOPHOLITE, *ô-lŏf′ō-līt* [Gr. *oulos*, wool; *pholeos*, cave; *lithos*, stone]: name given to gypsum that has assumed certain curved or twisted forms. The word is employed in descriptions of the Mammoth Cave of Kentucky.

OULORRHAGY, *ô-lŏr′a-jĭ*, or ULORRHAGIA [Gr. *oulon*, gum; root *rhag*, flow]: bleeding of the gums.

OUNCE, n. *owns* [F. *once*, an ounce—from It. *oncia*—from L. *uncĭa* (derived by Varro from *unus*), name of the 12th part of the *as* or *libra* (pound), applied also to the 12th part of any magnitude, whether of length, surface, or capacity: thence *inch*, the 12th part of a foot]: a division of the pound weight; one-12th of a lb. troy; one-16th of a lb. avoirdupois: see POUND.

OUNCE, n. *owns*, or ONCE, n. *ŏns* [F. *once:* Sp. *onza*], (*Felis Uncia*, or *Leopardus Uncia*): large feline animal, nearly resembling the leopard, but having much rougher and longer hair, a longer and much more bushy tail; the general color is also paler, the rosette-like spots are less sharply defined, and there is a black spot behind the ears. Little is known of the O.; it is described by Buffon, but naturalists were for some time inclined to regard it as identical with the leopard, and its name has been transferred in S. America to the jaguar. It is a native of India and Persia, and probably of mountainous districts.

OUNCE-LAND, *owns′land:* in the Orkney Islands, before annexation to Scotland, an area of land paying an annual tax of an ounce of silver; in Orkney dialect, *Unisland.*

OUNDY, *own′dĭ* [L. *unda*, wave—through OF. *ounde*]: wavy; undulating; scalloped.

OUR, pron. *owr* [Goth. and Ger. *uns*, us: Goth. *unsar;* Ger. *unser;* AS. *ure*, our]: pertaining to or belonging to us. OURS, *owrz*, poss. of *we:* when the noun is expressed, *our* is employed—as, *our* house; when no noun is expressed, *ours* is employed—as, that house is *ours*, that is, *our* house. OURSELF, comp. pron. *owr-sĕlf′*, plu. OURSELVES, *owr-sĕlvz′*, not another or other; used almost wholly in the plural, and by way of emphasis. OURSELF, in *OE.*, used in the regal style.

OURANG-OUTANG: another spelling of ORANG-OUTANG.

OURANOGRAPHY, n. *ow'răn-ŏg'ră-fi* [Gr. *ourănos*, heaven; *graphō*, I write]: a description of the heavens.

OUR'ARI: see CURARE.

OURAY, *ô-rā':* town, cap. of Ouray co., Colo.; on the Uncompahgre river and the Denver and Rio Grande railroad; at the foot of Mount Hayden, 400 m. s.w. of Denver; 7,200 ft. above sea-level. It is at the bottom of a deep bowl in the Rocky Mountains, was named after the celebrated Ute Indian chief, and was reached first by adventurous mining prospectors 1875, July. Though more than 300 m. from a shipping-point, the richness of its gold and silver mines attracted large numbers of experienced miners, and merchants and traders soon followed. The publication of a weekly newspaper, *The Solid Muldoon*, 1878, gave the town its first celebrity; and the extension to it of the Denver and Rio Grande railroad, 1887, brought it in communication with the outer world, and in one year nearly doubled its output of precious minerals. The town contains a co. court-house; Meth. Episc., Presb., Prot. Episc., and Rom. Cath. churches; excellent school facilities; water-works; electric light plant; sampling-mills; 1 national bank (cap. $50,000) and 1 private bank; and 2 weekly newspapers. All local expenses are defrayed by saloon license fees. The mineral output was (1876) $800; (1887) $1,497,892; (1888) $2,123,000. Pop. (1880) 865; (1890) 6,000.

OURO PRETO, *ô'rō prā'tō* (black gold): city of Brazil, cap. of the province of Minas Geraes; among barren mountains, 4,000 ft. above sea-level, 200 m. n.n.w. of Rio Janeiro. It contains the governor's residence and a college, and consists mainly of narrow and irregular streets. Although the neighboring mountains are very auriferous, and the mines were formerly the richest in the kingdom, the mining is now reduced to comparatively unprofitable washings. There is good trade in coffee, etc., with Rio Janeiro, though retarded by lack of good roads. The journey from O. P. to the cap. of the republic is performed by horses and mules only, and ordinarily requires 15 days. Pop. about 4,000.

OUSE, *ôz;* for distinction called also the NORTHERN or YORKSHIRE OUSE: river in England, formed by union of the Swale and the Ure, in the immediate vicinity of the village of Boroughbridge, and flowing s.e. past York, Selby, and Goole. About eight m. below Goole, it joins the Trent, and forms the estuary of the Humber. The length of its course from Boroughbridge is 60 m., for the last 45 of which (from the city of York) it is navigable for large vessels. Its principal affluents are the Wharf and the Aire from the w., and the Derwent from the n.e. The basin of the O., or the Vale of York, commences from the n. boundary of the county, near the river Tees, from whose basin it is separated by a low ridge of hills, and extends s., including almost the whole of the county. See YORKSHIRE.

OUSE, *ôz*, GREAT: river in England, rising close to the town Brackley, in the s. of Northamptonshire, and flowing n.e. through the counties of Buckingham, Bedford, Huntingdon, Cambridge, and Norfolk—falling into the Wash 2½ m. below King's Lynn. It is 160 m. in entire length, and is navigable about 50 m. It receives from the e. and s. the Ivel, Cam, Lark, and Little Ouse.

OU'SEL: see OUZEL.

OUSELEY, *ôz'lē*, Sir FREDERICK ARTHUR GORE, MUS. DOC.: born London, 1825, Aug. 12; son of Sir Gore O. He graduated from Christ-Church, Oxford, 1846, and took the degree M.A. 1849. In the latter year he was ordained deacon, and priest 1855. He had a remarkable talent for music, composed an opera when 8 years of age, received from Oxford the degree Bachelor of Music 1850 and Doctor of Music 1854, and became prof. of music in Oxford Univ. 1855. He built a fine church, of which he became vicar 1856; and was one of the founders of St. Michael's College, of which he has long been warden. In 1886 he became canon of Hereford Cathedral. He has published *Hagar*, an oratorio, a large number of anthems, and several works on music, which have been accepted as standards. Among his books are: *Harmony* (1869); *Counterpoint and Fugue* (1869); and a *Treatise on Musical Form and General Composition* (1875).

OUSE'LEY, GIDEON: 1762–1839, May 14; b. Dunmore, Galway, Ireland. He was liberally educated, in hope that he would enter the govt. service, but became a convert to the Wesleyan faith 1789, and commenced preaching as an evangelist. For 7 years he preached with great success to crowds which he collected in the streets, at fairs, and at markets. The Wesleyans appointed him their missionary for Ireland 1799. He travelled throughout the country, usually sat on his horse while preaching, and often preached from 3 to 5 sermons per day. His converts were numbered by thousands, and included many young men who had been educated for the Rom. Cath. priesthood. He is known as 'the Protestant apostle of Ireland.' He wrote several books, of which *Old Christianity and Papal Novelties* had widest circulation.

OUSE'LEY, Sir WILLIAM, LL.D.: orientalist: 1769–1842; b. Monmouthshire, England; son of Capt. Ralph O.; of an Irish family. He was for a short time cornet of dragoons, but retired from the army to devote himself to the study of Oriental languages. He wrote *Persian Miscellanies; Oriental Collections; Epitome of Persian History; Oriental Geography; Observations on Some Medals and Gems Bearing Inscriptions in the Pahlavi or Ancient Persian Character; Travels in Persia; Anecdotes from Oriental Bibliography.*

OUSE'LEY, Sir WILLIAM GORE, D.C.L.: 1791–1866, Mar. 6; b. London: diplomat. He entered the diplomatic service early in life, and served in many countries in both hemispheres. He was an *attaché* of the British legation at Stockholm 1817, at Washington 1825, and held sundry diplomatic positions at Rio Janeiro, Buenos Ayres, Montevideo, and Asuncion 1832–51; visited the United States on a special mission 1857. He wrote: *Remarks on the Statistics and Political Institutions of the United States* (1832); *Notes on the Slave Trade* (1850); *Views of S. America* (1852).

OUST, v. *owst* [OF. *oster;* F. *ôter*, to remove, to expel from—from mid. L. *haustare*, to drink often—*haurīrĕ*, to drink: Prov. *ostar*, to take away (see OUT 1)]: to remove by force; to eject or expel. OUST'ING, imp. OUST'ED, pp. OUST'ER, in *law:* see EJECTMENT, ACTION OF.

OUT, a. *owt* [Icel. *út;* AS. *ute;* Ger. *aus*, out, out of—perhaps from the cry *huss* or *hut!* used to drive out dogs: W. *hwt*, off, away: Sw. *hut*, away, quiet, applied to dogs]: exterior: AD. on or to the outside; without; not at home; in a state of exhaustion; in a state of extinction; not in office; not in employment; to the end, as, 'hear me *out;*' without restraint, as, 'I dare laugh *out;*' not in the hands of the owner, as, 'the lands are *out* upon lease;' with parts of clothes torn, as, *out* at the elbows; *out* at heels, denoting poverty; incurring loss, as, *out* of pocket: INT. away; begone: PREFIX, beyond; exceeding; above. OUT OF, prep. from; beyond; not in; not within; deviating from; without; in consequence of. TO FIND OUT, to discover. TO LET OUT, to put forth strength or speed; to reveal. TO CROP OUT, in *geol.*, to show itself, as a stratum, thrust up and appearing on the surface. TO PUT OUT, to annoy; to disturb; to perplex. OUT AND OUT, thoroughgoing; complete. OUT OF THE WAY, outlying; obscure; uncommon; unusual; eccentric. OUT OF HAND, immediately. OUT OF PRINT, said of a book of which all the copies have been sold or otherwise disposed of. OUT OF SEASON, not in the proper time or season. OUT OF SORTS, ailing; unwell. OUT OF TEMPER, in bad temper; sullen. OUT OF TRIM, not properly prepared. OUT OF TUNE, harsh; discordant. OUT UPON YOU and OUT UPON IT, away with you; away with it—phrases expressing dislike or contempt. *Note.*—In all words having *out* as a prefix, the root-words are found by referring to the word and its prefix—the prefix meaning 'beyond; exceeding; above.'

OUT, n. *owt* [see Out 1]: one who or that which is without; opposed to *in;* a nook or corner; an open space: V. to deprive by expulsion. Out′ing, imp.: N. a trip; a going from home on pleasure. Out′ed, pp. Outness, n. *owt′nĕs*, the state of being out; externality. Ins and outs, nooks and corners. To make an out, among *printers*, to omit something in setting up copy.

OUTBALANCE, v. *owt-băl′ăns:* to exceed in weight or effect.

OUTBID, v. *owt-bĭd′:* to bid more than another.

OUTBOUND, a. *owt′bownd:* proceeding from one country to another, as a ship.

OUTBRAVE, v. *owt-brāv′:* to bear down by more daring or by greater splendor.

OUTBREAK, n. *owt′brāk:* an eruption; a bursting forth. Out′breaking, n. that which bursts forth.

OUTBUILDING, n. *owt′bĭld-ĭng:* a building for common purposes near a large one.

OUT′BURST, n.: a breaking out; an explosion.

OUTCAST, n. *owt′kăst:* one cast out or expelled; one driven from home or country.

OUTCRAFT, v. *owt-krăft′:* in *OE.*, to excel in cunning.

OUTCROP, n. *owt′krŏp:* the exposure of the edge of strata at the earth's surface; edge of an inclined bed at the place where it rises to the surface. The line of the outcrop is called the strike, which is always at right angles to the dip. A stratum coming to the surface is said to *crop out.*

OUTCRY, n. *owt′krī:* clamor; noisy opposition; cry of distress.

OUTDO, v. *owt-dô′:* to surpass; to perform beyond another.

OUTDOOR, a. *owt′dōr:* being without the door; given to one not residing in the house, as, outdoor relief. Outdoors, or Out of doors, out of the house.

OUTED, a. *owt′ĕd* [from *out*]: put out; ended.

OUTER, a. *owt′ėr* [from *out*]: external; opposed to *inner.* Out′erly, ad. *-lĭ.* Out′ermost, a. *-mōst*, farthest out; remotest from the middle.

OUT′ER HOUSE: see Court of Session.

OUTFACE, v. *owt-fās′:* in *OE.*, to bear down with impudence; to brave.

OUTFIT, n. *owt′fĭt:* necessaries, as clothing, etc., supplied for a sea-voyage; equipment—often in the plu. Outfits. Out′fitting, imp.: N. equipment for a voyage. Out′fitted, pp. Out′fitter, n. *-tėr*, a general dealer in everything necessary for a voyage, journey, or expedition, or the requisites for any business. Outfit allowance, in an *army*, a sum granted to non-commissioned officers promoted to commissions, to enable them to meet the charges for uniform and equipments.

OUTFLANK, v. *owt-flăngk′:* to extend a line of battle beyond that of another. Outflank′ing, imp. Outflanked′, pp. *-flăngkt′.*

OUTFLOW, n. *owt′flō:* a flowing out; an efflux.

OUTFLY, v. *owt-flī′:* to leave behind in flight.

OUTFROWN, v. *owt-frown′:* to overbear by frowns; to frown down.

OUTGENERAL, v. *owt-jĕn′ėr-ăl:* to gain advantage over by superior military skill. Outgen′eralling, or Outgen′eraling, imp. Outgen′eralled, or Outgen′eraled, pp. *-ăld.*

OUTGOING, n. *owt′gō-ĭng:* state of going out; expenditure; outlay; generally in plu. Out′goings, expenditure: Adj. opposed to *incoming*, as, *outgoing* tenant.

OUTGROW, v. *owt-grō′:* to grow too much for a time. Out′growth, n. *-grōth*, an excrescence.

OUTGUARD, n. *owt′gârd:* the farthest distant guard.

OUT-HEROD, v. *owt-hĕr′ŏd* [*out*, and *Herod*, the king of the Jews at the birth of Christ]: to overact the character of Herod; to surpass in wrong-doing. Out-Her′oding, imp. Out-Her′oded, pp.

OUTHOUSE, n. *owt′hows:* a little house at a small distance from the main one.

OUTING, n. *owt′ĭng* [Icel. *út*, out (see Out 1)]: a holiday excursion, generally to the seaside or country.

OUTLANDISH, a. *owt-lănd′ĭsh* [AS. *utlendisc;* Icel. *utlendr*, outlandish, foreign]: not native; foreign; vulgar; rude. Outland′ishness, n. *-ĭsh-nĕs*, state of being strange, rude, or barbarous. *Note.*—In OE., *inland*, in the sense of 'civilized,' was opposed to *outlandish*, rude; foreign: see Inland.

OUTLAST, v. *owt-lăst′:* to last longer than. Outlast′ing, imp. Outlast′ed, pp.

OUTLAW, n. *owt′law* [AS. *utlah*: Icel. *utlægja* an exile, an outlaw]: a person deprived of the benefit of law: V. to deprive of the benefit and protection of law; to proscribe. Out′lawing, imp. Out′lawed, pp. *-lawd:* Adj. excluded from the benefit of law. Outlawry, n. *owt′law-rĭ*, in *English law*, act of putting one out of the protection of the law, for contempt in wilfully avoiding execution of legal process. Formerly, in the common law courts, if the defender would not enter an appearance, certain proceedings were taken to outlaw him, so as to allow the action to go on without his appearance. These proceedings are now abolished; and, in the majority of cases, it is immaterial as regards the action whether the defendant appear or not, provided he was properly served with the original writ of summons. After judgment, he may still be outlawed, as a preliminary to seizing and selling his property. In criminal proceedings, outlawry still exists as part of the ordinary practice to compel a person against whom a bill of indictment for felony or misdemeanor has been found, but who will not come forward to take his trial, and who has not been arrested. In such a case, process of outlawry against him is awarded, which is a kind of temporary judgment; and while this process exists, he is out of the protection of the law, and forfeits all his property. The courts will not listen to any complaint or attend to his suit till he reverse the outlawry, which is generally done as a matter of course.—In the United States, there is now no process of outlawry in *civil* cases: it was always exceedingly rare, and has long been abolished in all the states.

OUTLAY, n. *owt′lā:* expenditure.

OUTLEARN, v. *owt-lėrn′:* in *OE.*, to discover.

OUTLET, n. *owt′lĕt* [Icel. *útlát: out*, and *let*]: the place or means by which anything escapes or is discharged.

OUTLICKER, n. *owt′lĭk-ėr* [Ger. *auslieger*, outrigger]: in *ships*, a small piece of timber fastened to the top of the poop, and standing out astern.

OUTLIERS, n. plu. *owt′lī-ėrz:* in *geol.*, portions of any stratified group of rocks which lie detached, or out from the main body.

OUTLINE, n. *owt′līn:* the line by which a figure is defined; the first sketch of a figure, or of a scheme or design: V. to sketch; to delineate. OUT′LINING, imp. OUT′LINED, pp. *-līnd.*—SYN. of 'outline, n.': delineation; sketch; draught; contour; plan; design; extremity.

OUTLIVE, v. *owt-lĭv′:* to live beyond; to survive; to live after something has ceased. OUTLIV′ING, imp. OUTLIVED, pp. *-lĭvd′.*

OUTLOOK, n. *owt′lûk:* a vigilant watch; a prospect or view: V. in *OE.*, to browbeat; to look out.

OUTLUSTRE, or OUTLUSTER, v. *owt-lŭs′tėr* [*out*, and *lustre*]: to excel in brightness.

OUTLYING, a. *owt′lī-ĭng:* remote from the main body or design; being on the exterior or frontier.

OUTMANEUVER, v. *owt′mă-nô′vėr:* to surpass in maneuver.

OUTMARCH, v. *owt-mârch′:* to march faster than.

OUTMOST, a. *owt′mōst:* farthest remote from the middle.

OUTNESS: see under OUT 2.

OUTNUMBER, v. *owt-nŭm′bėr:* to exceed in number.

OUT-PENSIONER, n. *owt′-pĕn-shŭn-ėr:* an invalid soldier or sailor, who is a pensioner of Chelsea or Greenwich hospitals, and is at liberty to reside where he pleases.

OUTPORT, n. *owt′pōrt:* a port or harbor at some distance from the chief port.

OUTPOST, n. *owt'pōst:* in *military affairs*, a station at a distance from the main body; the company of soldiers so placed. Such bodies of troops, usually small, are posted for the purpose of preventing an enemy approaching without notice; also to offer opposition to his progress, while the main force prepares for resistance. Outguards march off to their position silently, and pay no compliments of any kind to officers or others. As soon as the officer commanding an O. arrives on his ground, he proceeds to examine carefully the environs, noting all heights within rifle-range, roads and paths by which an enemy may approach, etc. He also takes such impromptu means of strengthening his position as occur to him—felling a tree here, cutting brushwood there, blocking a path in another place, and resorting to any expedient which may serve to delay the foe at point-blank range—an object of importance, as a stoppage at such a point is known to act as a great discouragement to advancing troops.

OUTPOUR, v. *owt-pōr':* to send forth in a stream. OUTPOURING, n. *owt'pōr-ĭng*, an effusion; an abundant supply.

OUTPUT, n. *owt'pût:* a term in the iron or coal trade for the quantity of metal annually made by the furnaces, or for the quantity of coal produced from one or more pits.

OUTRAGE, n. *owt'rāj* [OF. *oultrage* or *outrage*, excess, unreasonableness—from L. *ultra;* OF. *oltre* and *outre*, beyond, exceeding, with postfix *-age* = L. *-aticum:* It. *oltraggio*]: open and wanton violence either to a person or thing; excessive injury; abuse: V. to treat with extreme violence and injury; to injure by rude, rough treatment of anything; to do violence in words; violate. OUT'RAGING, imp. OUTRAGED, pp. *owt'rājd.* OUTRA'GEOUS, a. *-rā'jŭs*, excessive in a high degree; violent; exceeding all bounds of moderation. OUTRA'GEOUSLY, ad. *-lĭ.* OUTRA'GEOUSNESS, n. *-nĕs*, the quality of being outrageous; fury; violence.—SYN. of 'outrage, n.': affront; abuse; insult; violence; injury;—of 'outrageous': violent; furious; raging; exorbitant; turbulent; tumultuous; excessive; enormous; atrocious.

OUTRAM, *ô'tram*, Sir JAMES, G.C.B.: lieutenant-general and statesman: 1803, Jan. 29—1863, Mar. 11; b. Butterley Hall, Derbyshire, England, the residence of his father, Benjamin O., a civil engineer. O. studied at Marischal College, Aberdeen; was sent to India as cadet 1819; was made lieut. and adjt. of the 23d Bombay native infantry; then took command of and disciplined the wild Bheels of Candeish, and successfully led them against the Daung tribes. 1835–38 he was engaged in re-establishing order in the Mahi Kânta. He went as aide-de-camp with Lord Keane into Afghanistan; and his ride from Kelat, through the dangers of the Bolan Pass, is famous in Indian annals. As commissioner in Sinde, he made a bold defense of the Ameers against the aggressive policy of Gen. Sir Charles James Napier. He was afterward resident at Sattara and Baroda, and on the annexation of Oude was made resident and commissioner by Lord Dalhousie. His health failing, he returned to England 1856; but when the war with Persia broke out, O. accompanied the expedition to the Persian Gulf, with diplomatic powers as commissioner. He conducted several brilliant and successful operations; the campaign was short, decisive, and triumphant. Returning to India 1857, he was commissioned to take charge of the forces advancing to the relief of Lucknow. He chivalrously waived the command in favor of his old lieut., Havelock (q.v.), and, taking up only his civil appointment as chief commissioner of Oude, tendered his military services to Havelock as a volunteer. Lucknow was relieved, and O. took the command, but only to be in turn besieged. He held the Alumbagh against almost overwhelming forces, until Lord Clyde advanced to his relief. He then made a skilful movement up the left bank of the Gumti, which led to a final and complete victory over the insurgents. He was made chief commissioner of Oude; and though he had strongly opposed its annexation, he was the man who did most to restore British rule, and attach the people to it. For his eminent services, he was promoted to the rank of lieut.gen. 1858, and received the thanks of parliament 1860. He took his seat as a member of the supreme council of India, in Calcutta, but sank under the climate, and returned to England 1860, stricken by fatal disease. The communities of India voted him a statue at Calcutta, founded an institution to his honor, and presented him with commemorative gifts. A banquet was given to him and his chief and companion-in-arms, Lord Clyde, by the city of London. His English admirers determined to erect a statue to his honor in London. He spent the winter 1861–2 in Egypt; and, after a short residence in s. France, died at Paris. O. was styled by Sir Charles Napier the 'Bayard of India.' There is no more gallant name in the whole list of distinguished Indian soldiers. His services in the East, as soldier and diplomatist, extended over 40 years. He was ever the generous protector of the dark-skinned races among whom his lot was thrown, and set a bright example to men in high office of moderation, conciliation, humanity, and practical Christianity. See his *Biography* by Sir F. Goldsmid (1880).

OUTRÉ, a. *ô′trā* [F. *outré;* OF. *oltre*—from L. *ultra*, beyond, exceeding]: extravagant; overstrained; exaggerated.

OUTREACH, v. *owt-rēch′:* to extend beyond. OUTREACH′ING, imp. OUTREACHED, pp. *-rēcht′*.

OUTRIDE, v. *owt-rīd′:* to ride faster than. OUTRI′DING, imp. OUTRID′DEN, pp. *-rĭd′n*. OUT′RIDER, n. *-dėr*, a servant on horseback who attends a carriage, at some little distance from it.

OUTRIGGER, n. *owt'rĭg-gėr:* in its proper sense, a beam or spar fastened horizontally to the cross-trees or otherwise, for the purpose of extending further from the mast or topmast the backstay or other rope by which that mast or topmast is supported: the power of the stay is thus increased. Such a contrivance is used to secure the masts in the operation of careening. The term is also used with doubtful propriety—because no 'rigging' is in the case—to denote the apparatus for increasing the leverage of an oar, by removing the resistance, as represented by the side of the boat (see OAR), further from the power represented by the rower's hand. This is effected by fixing an iron bracket to the boat's side, the row-lock being at the bracket's extremity; thus obtaining the necessary leverage without adding to the width of the boat itself. The name is applied also to the light racing-boats which have such row-lock projections. In the proas of the Indian seas, an O. is a contrivance to counterbalance their very large, heavy sails.

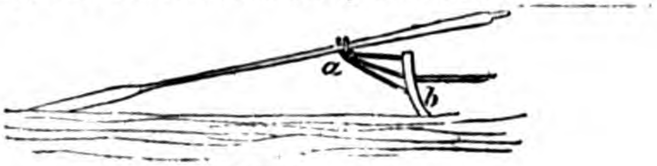


Fig. 1.

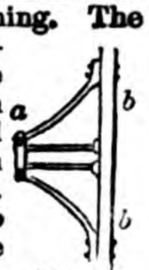


Fig. 2. *a*, outrigger; *b*, side of boat.

OUTRIGHT, ad. *owt-rīt':* at once; completely; utterly.

OUTROAD, n. *owt'rōd* [OE. *road*, a riding]: in *OE.*, a riding out; an excursion.

OUTROAR, n. *owt'rōr:* a great confusion of many loud voices: V. *owt-rōr'*, to roar louder than.

OUTRUN, v. *owt-rŭn':* to excel in running; to exceed. OUTRUN THE CONSTABLE, to get into debt; to spend more than one's income—referring to the constable, the arrester for debt.

OUTSAIL, v. *owt-sāl':* to leave behind in sailing.

OUTSCORN, v. *owt-skŏrn':* in *OE.*, to bear down or confront by contempt.

OUTSELL, v. *owt-sĕl':* to sell at a lower figure; to have a greater sale. OUTSEL'LING, imp. OUTSOLD', pp.

OUTSET, n. *owt'sĕt:* beginning; first entrance on any business.

OUTSHINE, v. *owt-shīn':* to send forth brightness; to excel in lustre.

OUTSIDE, n. *owt'sīd:* the external or outer part of a thing; superficial appearance; part most remote from the middle; the part lying without; the utmost; a passenger on the top of a coach: ADJ. external; exterior. OUTSIDES, n. plu. *owt'sīdz,* the exterior sheets of a ream of printing or writing paper; spoiled sheets of paper.

OUTSKIRTS, n. *owt′skėrts:* border; suburbs.

OUTSLEEP, v. *owt-slēp′:* to sleep beyond.

OUTSPAN, v. *owt-spăn′* [Eng. *out*, and Dut. *spannen*, to put horses to—from *span*, a team]: a term used in Cape Colony, etc., for unyoking ox-teams from wagons. OUTSPAN′NING, imp. OUTSPANNED′, pp. *-spănd′*.

OUTSPEAK, v. *owt-spēk′:* in *OE.*, to speak out; to speak something beyond; to exceed.

OUTSPOKE, v. *owt-spōk′:* used in ballad poetry for *spoke*. OUTSPOKEN, a. *-spōk′n*, free of speech; bold of speech.

OUTSPREAD, v. *owt-sprĕd′:* to extend; to diffuse. OUTSPREAD′ING, imp.: N. the act of spreading over or diffusing.

OUTSTANDING, a. *owt-stănd′ĭng:* projecting; remaining uncollected or unpaid.

OUTSTARE, v. *owt-stār′:* to face down; to browbeat.

OUTSTEP, v. *owt-stĕp′:* to exceed.

OUTSTRETCH, v. *owt-strĕch′:* to expand; to spread out. OUTSTRETCH′ING, imp. OUTSTRETCHED′, pp. *-strĕcht′*.

OUTSTRIP, v. *owt-strĭp′:* to leave behind; to advance beyond.

OUTSWEAR, v. *owt-swār′:* to overpower by or go beyond in swearing.

OUTSWEETEN, v. *owt-swēt′ĕn:* to excel in sweetness.

OUTVALUE, v. *owt-văl′ū:* to exceed in value or price.

OUTVENOM, v. *owt-vĕn′ŏm:* to exceed in poisonous or deadly qualities.

OUTVIE, v. *owt-vī′:* to exceed in rivalry; to surpass. OUTVY′ING, imp. OUTVIED′, pp. *-vīd′*.

OUTVOICE, v. *owt-voys′:* in *OE.*, to exceed in clamor; to outroar.

OUTVOTE, v. *owt-vōt′:* to defeat by a higher number of votes. OUTVO′TING, imp. OUTVO′TED, pp.

OUTWALK, v. *owt-wawk′:* to leave behind in walking.

OUTWALL, n. *owt′wăl:* in *OE.*, outward part of a building; superficial appearance.

OUTWARD, a. *owt′wėrd* [AS. *uteweard*, outward—from *ute*, out; *weard*, toward]: external; extrinsic; forming the superficial part; opposed to *inward;* in *theol.*, carnal; not spiritual: N. in *OE.*, an external form. OUT′WARD, or OUT′WARDS, ad. *-wėrdz*, to the outer parts; from the port of a country; seaward. OUT′WARDLY, ad. *-lĭ*, externally; in appearance only. OUTWARD-BOUND, a proceeding from a port of a country to foreign parts; opposed to *homeward-bound.*

OUTWEAR, v. *owt-wār′:* to wear out; to surpass in enduring qualities.

OUTWEIGH, v. *owt-wā′:* to exceed in weight, effect, or importance; to preponderate. OUTWEIGH′ING, imp. OUTWEIGHED′, pp. *-wād′*.

OUTWENT, v. *owt-wĕnt′:* pt. of verb Outgo; exceeded; surpassed in going or running.

OUTWIT, v. *owt-wĭt′:* to overreach; to defeat by superior ingenuity or craft. Outwit′ting, imp. Outwit′ted, pp.

OUTWORK, n. *owt′wėrk :* in *fortification*, a minor defense constructed beyond the main body of a work, for keeping the enemy at a distance, or commanding certain salient points which it is undesirable that he should occupy. Outworks are ravelins, lunettes, hornworks, crownworks, demilunes, tenailles, etc.: they occur in certain necessary order, as a ravelin before the curtain and tenaille, a hornwork before a ravelin, and so on.

OUTWORTH, v. *owt-wėrth′:* in *OE.*, to excel in value.

OUTWREST, v. *owt-rĕst′:* in *OE.*, to extort by violence.

OUVRARD, *ô-vrâr′*, Gabriel Julien: 1770, Oct. 11—1846, Oct.: French contractor and financier. He entered mercantile life, and engaged in numerous speculations; became an object of suspicion 1793, and avoided arrest and execution as a public enemy by joining the army, in which he served with distinction. When peace was restored, he established himself in trade at Nantes, and 1797 secured a govt. contract, on which he realized nearly $3,000,000. He then organized a banking company at Paris, loaned immense sums of money to the govt., made large advances to the Spanish govt., and 1805 secured a monopoly of the Spanish colonial trade. The financial embarrassments of the Spanish govt. temporarily crippled the bank, though it continued in business till 1806, when Napoleon, whose ill-will had previously been incurred by its refusal of a loan, closed its affairs and placed O. under arrest. He succeeded in reaching Amsterdam 1810, but was again arrested, and was imprisoned till the overthrow of Napoleon 1813. He then secured various govt. contracts, planned a system of finance which was adopted by the govt., was prosecuted for fraud and imprisoned for some years, and on his liberation went to London, where he spent the remainder of his life in obscurity.

OUVRIERS, n. plu. *ûv′rĭ-āz* [F. *ouvrier;* OF. *ovrier*—from L. *operārĭŭs*, belonging to labor—from *opĕra*, work]: artificers; mechanics; journeymen.

OUZEL, or Ousel, n. *ô′zĕl* [AS. *osle;* Ger. *amsel*, blackbird; OF. *oisel*, bird]: old name of the blackbird, as is evident from the descriptive lines of Bottom's song in *Midsummer Night's Dream :*

> ‘The ousel cock, so black of hue,
> With orange tawny bill.’

It is applied also to other birds, chiefly of the thrush family. Thus, one British thrush is called the Ring Ouzel. The Dipper (q.v.) is generally known as the Water Ouzel; and the Rose-colored Pastor is called the Rose-colored Ouzel.

OVA, n. plu. *ō′vă* [L. *ova*, plu. of *ovum*, an egg]: the eggs of any animal; certain moldings in the form of eggs.

OVAL, a. *ō′văl* [OF. *oval;* F. *ovale;* Sp. *oval;* It. *ovale*, shaped like an egg—from L. *ovālis*—from *ovum*, an egg]: of oblong round form; having the figure or shape of an egg; applied to an outline or tracing in the form of a longitudinal section through the centre of an egg: N. a body or figure in the shape of an egg; an oval object; an ellipse; an outline in the form of a longitudinal section through the centre of an egg. The oval has a general resemblance to the ellipse; unlike the latter, however, it is not symmetrical, but is thicker at one end than the other, and at the thin end narrows almost to a point. The term 'oval' is also used indiscriminately with 'nodus,' 'loop,' to denote the figure formed either by a curve which returns upon itself, as the lemniscata, etc., or the loops of the cubical and semicubical parabolas and other curves. In scientific language, it is distinguished specially from the term 'elliptical,' with which, in common parlance, it is usually confounded. O′VALLY, ad. *-lĭ*, in an oval form; so as to be oval. OVALNESS, n. *ō′val-nĕs*, property of being oval. OVALOID, a. *ō′val-oyd*, somewhat oval. OVALESCENT, a. *ō-va-lĕs′ĕnt*, tending to assume an oval form.

OVALBUMEN, n. *ō′văl-bū′mĕn* [L. *ovum*, an egg; *albumen*, white of egg]: albumen of an egg, as distinguished from albumen coming from any other source.

OVALIA, *ō-vā′lĭ-â* [L. *ovalis*, oval, in neut. pl.]: in Latreille's system of zoology, name of those *Læmodipoda* which have the body oval with the segments transverse; the *Cyamidæ* (whale-lice) belong to the division *Ovalia*.

OVAM′POS AND OVAMPOLAND: tribe and their country in the region n. of Great Namaqualand, in s. Africa, extending n. to the Cuanene river, and s. to the parallel of 23° s. lat. The Ovampos or Otjiherero are seemingly a connecting link between the Kafir and negro races. The Ovampo tribes are described by Andersson as of very dark complexion, tall and robust, but remarkably ugly. He found them, however, honest, industrious, and hospitable. They are not entirely pastoral, but cultivate much corn. Living in the same country are the Cattle Damaras, with still more of the negro type, a stout, athletic people, very dirty in their habits, and generally armed with the bow and arrow. They live in constant warfare with the Ghondannup, or Hill Damaras, a nearly pure negro race, on the one hand, and with the Namaqua Hottentots, s. of them, on the other.

Ovampoland is a more fertile region than Namaqualand, from which it is separated by a wide belt of densely-bushed country. It has few rivers, and these not of perennial flow. About fifty m. from the coast, the country rises to a table-land about 6,000 ft. above sea-level, and then declines s. and e. into the deserts of the Kalihari, and the region of Lake N'gami.

Many strong indications of copper ore are found. The principal rivers, or rather water-courses, are the Swakop, Kusip, and their branches, which enter the Atlantic a few miles n. of Walfish Bay. The other rivers in the interior seem to lose themselves in the sands. The climate is healthful, except near the coast, where fever in some seasons prevails. It seldom rains in the coast region, which is very desolate and almost devoid of water. Thunder-storms are very violent in summer. All the large mammalia are more or less plentiful, according as water may be found at the different drinking-places. Elephants, rhinoceroses, elands, and other large animals driven from the s. by the march of civilization, take refuge in the desert region e. of Ovampoland, where sportsmen like Green and Andersson have killed as many as 12 elephants in a day. The country was described first by Sir J. Alexander, who visited its s. border. Galton afterward penetrated much further north; and C. J. Andersson has since fully explored it nearly as far n. as the Cuanene. Large numbers of horned cattle are annually collected by traders from the Cape in these regions, and whales abound off the coast. The trade in ostrich-feathers and ivory is of increasing importance, and several trading-stations are established for collection of native products. Some elementary books have been printed in the Otjiherero dialect.

O'VAR: prosperous town of Portugal, province of Beira, 17 m. n. of Aveiro, 20 m. s. of Oporto, on a branch of the Bay of Aveiro. It has an extensive fishery and considerable trade. Pop. 10,500.

OVARIES: organs peculiar to the female, analogous to the testes in the male. They are two oblong flattened bodies (about an inch and a half in length, three-quarters of an inch in width, and nearly half an inch thick in the human subject), on either side of the uterus, to which they are connected by ligaments and by the Fallopian tube.

The ovary is composed of two well-defined portions—a superficial or 'cortical' portion, and a deep or 'medullary' portion. The whole is inclosed in a tough fibrous coating, which is, however, closely blended with the cortical portion, and cannot be stripped off. It is termed the *tunica albuginea.* The medullary portion is highly vascular and of reddish color. The cortical portion in the adult ovary contains an enormous number of vesicles, varying greatly in size. These are the *Graafian follicles*, and contain the ova or germs—the female element of reproduction. Their number is estimated at 30,000. From 10 to 20 large and more or less mature vesicles are found near the surface, to which they gradually approach as they become developed. The structure of these ovisacs and their contained ova is somewhat complex, and cannot be described here. More or less coincident with menstruation is the process of *ovulation*, i.e., rupture of the wall of a Graafian follicle, and escape of the contained ovum. On its escape from the ovary, the ovum enters the end of the Fallopian tube, by which it is conveyed into the uterus.

Immediately after the escape of the ovum, the empty follicle becomes filled with blood. The wall of the follicle increases in thickness, owing to the multiplication of its component cell elements. The pigment of the blood undergoes a change, and becomes bright yellow in color. This body is termed the *corpus luteum.* Should the discharged ovum escape from the uterus without becoming impregnated, the corpus luteum reaches its full size in three weeks, and gradually becomes absorbed, and at the end of nine weeks is represented by merely a minute pucker. Should pregnancy occur, the corpus luteum increases in size two months, remains stationary four months, then decreases during the remainder of pregnancy, but is permanently represented by a well-marked cicatrix. This latter is termed the *true* corpus luteum, to distinguish it from that of menstruation.

The ovary is liable to several diseased conditions: (1) It is the seat of acute and chronic inflammation: this may arise from injuries during labor, operations in the pelvis, but very frequently is the result of gonorrheal infection, spreading from the vagina. Such inflammations cause great organic changes in the structure, often leading to sterility; and they are usually associated with severe pain, frequently so intense as to unfit the subject for all active duty. (2) The ovary is the seat of new growths, which may be of several varieties. Some represent enlargements of one or more Graafian follicles, and attain enormous size, sometimes weighing 100 lbs. or more. They contain fluid usually of viscid, ropy nature and brownish color; but sometimes presenting other characters: these enlargements are known as *ovarian cysts* or *ovarian tumors:* the only disease with which they can be confounded is *ascites*, or common abdominal dropsy. Other tumors are more or less solid, and contain portions of hair, teeth, bone, etc., and are known as *dermoid tumors.* Moreover, either sort of tumor may become the seat of cancerous disease.

The treatment of ovarian disease by removal of the offending organ is one of the triumphs of modern surgery. Formerly, relief in cystomata was obtained only temporarily by tapping, that is, withdrawing some of the fluid by means of a trocar and cannula. But the tumor almost always filled again, and though tapping might be repeated time after time—in one case on record 66 times at intervals of about a month; in another, 128 times at intervals of about six weeks—the patient ultimately succumbed to the exhausting drain on the system. Meanwhile, existence was rendered a misery. Now the abdominal wall is laid open, the tumor emptied as much as possible of its contents, the collapsed sac drawn through the incision, its neck secured by ligature or otherwise, the mass cut away, the stump returned to the abdomen, and the wound carefully closed by stitches. Fifty years ago, the operation was performed by a few surgeons, under protest of the great majority of the medical profession; now it takes its place as a routine operation, demanded in any suitable case, and performed with results, as regards the saving of life and restoration to health, together with an immunity from risk, which can be claimed by no other major operation. The operation for extirpation of ovarian cystoma was performed first by Ephraim McDowell, M.D., of Ky., 1809; but was established in England as a regular operation by Charles Clay of Manchester, who operated on his first case 1842. Clay operated on nearly 400 cases, with 69 per cent. of recoveries. Since then, the operation has been performed many thousands of times, and the mortality has been reduced to a figure which renders the operation, while always one of the gravest, yet, in competent hands, one of the safest in surgery. To this result, the labors in Britain of Spencer Wells, Thomas Keith, and Lawson Tait—and in the United States of Washington L. Atlee, J. Marion Sims, and Edmund R. Peaslee—have mainly contributed. With the best operators, the mortality at present is probably not more than 6 per cent. This result has been ascribed to various causes, such as the mode of treating the pedicle or stump, the use of antiseptics, etc.; but is probably due most to the experience acquired in dealing with the various complications and difficulties arising in the operation.

Within the last few years, the removal of the ovaries and Fallopian tubes, for other than cystic disease, has become recognized as a regular operation, and is now frequently performed. The conditions considered as demanding this are: (1) Chronic inflammation in the ovaries or tubes, resulting in formation of pus, etc., in the tubes, or giving rise to intolerable pain and discomfort, rendering life utterly miserable; (2) Cases of fibroid tumor of the uterus, in which life is threatened by the great loss of blood which these tumors often cause. Removal of the ovaries in these cases is usually followed by cessation of growth and shrinking of the tumor, and entire stoppage of serious hemorrhage. The question as to the beneficial effects of the interference in all cases in the first group is still *sub judice;* but the advantage of the procedure in the second group is almost universally admitted. The name of Lawson Tait specially is associated with this operation.—Consult *Diagnosis and Treatment of Abdominal Tumors*, by Sir Spencer Wells (1885); *Diseases of Women*, by Lawson Tait (1885).

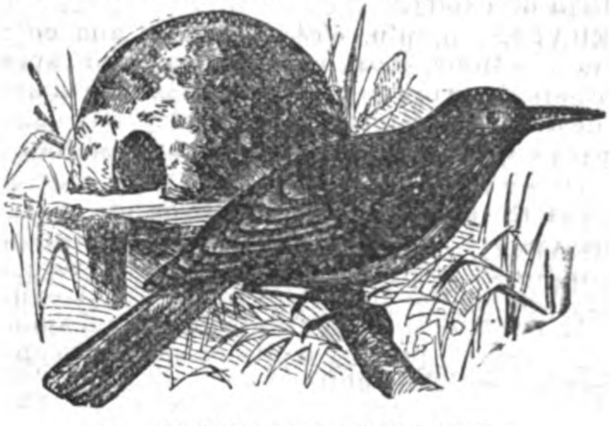
OVARY, n. *ō′vă-rĭ* [F. *ovaire;* Sp. *ovario*, an ovary—from mid. L. *ovārĭă*, the part of the body of birds where the eggs are formed—from L. *ovum*, an egg]: the part in the body of a female animal in which the eggs or first germs of future animals are lodged (see OVARIES): a hollow case in plants which incloses the young seeds (see GERMEN). OVARIAN, a. *ō-vā′rĭ-ăn*, of or relating to the ovary. OVA′RIOUS, a. *-ŭs*, consisting of eggs. OVA′RIUM, n. *-ŭm*, plu. OVA′RIA, *-ă*, an ovary. OVARIOTOMY, n. *ō-vā′rĭ-ŏt′ō-mĭ* [Gr. *tŏmē*, a cutting, a lopping]: in *anat.*, the operation of removing the ovaries. OVARITIS, n. *ō-vă-rī′tĭs*, inflammation of the ovaries. OVARALGIA, n. *ō′vă-răl′jĭ-ă* [Gr. *algos*, pain]: pain in the Ovaries (q.v.).

OVATE, a. *ō′vāt* [L. *ovātus*, shaped like an egg—from *ovum*, an egg]: in *bot.*, in the form of an egg; having the shape of a longitudinal section of an egg. O′VATE-LANCEOLATE, a. *-lăn′sē-ō-lāt* [L. *lancĕă*, a lance]: in *bot.*, a shape between that of an egg and spear-head. O′VATE-SUBULATE, a. *-sŭb′ū-lāt* [L. *sub′ula*, a shoemaker's awl]: in *bot.*, partly awl and partly egg-shaped. OVATO-OBLONG, a. *ō-vā′tō-ŏb-lŏng*, shaped like an egg, but more drawn out in length.

OVATION, n. *ō-vā′shŭn* [F. *ovation*—from L. *ovātĭōnem*, a lesser triumph of a general for an inferior victory, in which the rites and ceremonies were less imposing than in the triumph—from *ŏvō*, I exult, I rejoice· It. *ovazione*]: any extraordinary and spontaneous mark of respect paid by a city or people to an illustrious person: see TRIUMPH.

OVEN, n. *ŭv′n* [Ger. *ofen;* Goth. *auhns;* Icel. *ofn;* Gr. *ipnos*, an oven: comp. Skr. *agni;* L. *ignis*, fire]: an arched cell capable of being highly heated, used principally for baking bread; any movable utensil used for baking meats before the fire. The usual time-honored bakers' oven is a low-vaulted chamber of stone or brick: the furnace is near the small door at one end, the flue for the exit of the smoke at the other end. The oven is fired with wood fuel, and, when it is sufficiently heated, the fire is withdrawn, and the dough quickly put in on long wooden shovels. Of late, numerous plans have been devised which heat the oven by a fire outside the baking area, flues of various arrangement carrying the heated gases of combustion below and around the place where the dough is being baked; thus allowing baking to go on continuously, and avoiding the discoloring of the bread with ashes. In some ovens, the sole is capable of rotating, and of being so raised and lowered as to bring first one side, then the other, nearest the heat. In some, used especially for crackers, the dough is laid on metal or stoneware plates, fixed on an endless chain, and kept moving. Perkins's oven is heated by numerous pipes, through which a current of superheated water and steam circulates. Gas burners sometimes supply the heat. A disadvantage in most of the ingenious new types of oven is costliness; and in several the interior of the oven is kept too dry, and so hurts the flavor of the bread. See BREAD: UNFERMENTED BREAD: BREAD, ARMY: BAKERIES, ARMY: COOKERY (ARMY). For coke ovens, see COKE: see also STOVE.

OVEN-BIRD (*Furnarius*): genus of birds of family *Certhiadæ* (q.v.), natives of s. parts of S. America, interesting for the remarkable nests which they construct. They are small birds, with short wings and feeble power of flight. One species, *F. albogularis* or *F. rufus*, is found near Buenos Ayres; another, *F. fuliginosus*, inhabits the Malouine Islands. It is a fearless little bird, regarding the presence of man so little that it may be easily struck down with a switch. Both sexes take part in the construction of the nest, which is generally in an exposed situation, remarkably large, and of the shape of a dome, with a small entrance on one side, so as to have much resemblance to a rude oven. It is made of clay, grass, etc., well plastered together. Internally, it is divided into two chambers by a partition reaching nearly to the roof, the eggs being placed in the inner chamber, on a bed of soft grass and feathers. The outer chamber seems intended for the male.



Oven-bird (*Furnarius fuliginosus*).

OVENCHYMA, n. *ō-vĕng′kĭ-mă* [L. *ovum*, an egg; **Gr.** *eng′chuma*, an infusion, the substance of organs—from *ĕngchĕō*, I pour in]: in *bot.*, the tissue of plants composed of oval cells.

OVER, prep. *ō′vėr* [AS. *ofer* or *ober*, over, above; *ufan*, above, upward; *ufera*, higher: Goth. *ufar;* Dan. *over*, above: Ger. *ober*, upper, over; *über*, above: Gr. *huper;* L. *super*, over]: above; upon; opposed to *below;* above in authority; across, as, he leaped *over* the brook; through or diffusely, as, all the world *over;* covering or immersing; often contracted into *o'er:* AD. more than the quantity; beyond a limit; from one to another; from a country beyond the sea; on the surface; past, as, the winter is *over:* completely; in a great degree, as, *over*-difficult: ADJ. upper; beyond. OVER AGAIN, once more. OVER AGAINST, opposite. OVER AND ABOVE, besides; extra. OVER AND OVER, repeatedly. OVER THE LEFT, in *slang*, completely opposite. To GIVE OVER, to cease from; to consider hopeless. To RUN OVER, to flow or ride over; to read hastily. To THROW OVER, to betray; to desert; to fail to give expected help. ALL OVER, in every place; undone or finished, generally in an evil sense.

OVER, *ō′vėr* [AS. *ofer* or *ober*, above (see OVER, prep.)]: prefix, meaning 'above; beyond; too much; to excess.' *Note.*—OVER, as a prefix, is not usually separated by a hyphen: the words with the prefix OVER, keeping in mind the sense of the prefix, are mostly self-explanatory; accordingly, it has not been thought necessary to enter every possible compound having the prefix OVER, though it is hoped that no one in common use has been omitted.

OVERACT, v. *ō′vėr-ăkt′:* to perform to excess; to act more than necessary.

OVERALLS, n. plu. *ō′vėr-awlz* [*over*, and *all*]: loose trousers of a light, stout material, such as canvas, worn over others, by workmen, to keep them clean and from being destroyed; waterproof leggings.

OVERANXIOUS, a. *ō′vėr-ăngk′shŭs:* anxious to excess. O′VERAN′XIOUSLY, ad. *-lĭ.* O′VER-ANXI′ETY, n. *-ăng-zī′ĕ-tĭ*, the state of being overanxious.

OVERARCH, v. *ō′vėr-ârch′:* to cover as with an arch.

OVERAWE, v. *ō′vėr-aw′:* to restrain by fear or by superior influence. O′VERAW′ING, imp. O′VERAWED′, pp. *-awd′.*

OVERBALANCE, v. *ō′vėr-băl′ăns:* to weigh down; to exceed in weight, value, or importance: N. excess of weight or value. O′VERBAL′ANCING, imp. O′VERBAL′ANCED, pp. *-ănst.*

OVERBEAR, v. *ō′vėr-bär′:* to overpower; to subdue; to domineer over. O′VERBEAR′ING, imp.: ADJ. haughty; insolent; domineering. O′VERBEAR′INGLY, ad. *-lĭ.*

OVERBECK, *ō'vĕr-bĕk*, FRIEDRICH: 1789, July 4—1869, Nov.; b. Lübeck; descendant of a line of Prot. pastors: distinguished painter, to whom belongs a large share in the movement from which arose the modern German school of art, and the Christian art of the 19th c. He commenced his studies as an artist at Vienna 1806, as pupil of the pseudo-classical school of David; but, having adopted notions on art essentially different from those inculcated in the academy, he, with some like-minded friends, was expelled; and 1809 set out for Rome. His principle, now and always, was to abjure the classical renaissance and its sensuousness, and to 'abide by the Bible.' In Rome he was soon joined by Cornelius, Schadow, and Veit; and these four laid the foundation of a school that in no small degree influenced the taste for art in Europe, though they were scoffed at as 'Pre-Raphaelites,' 'Nazarites,' 'Church-Romantic painters,' and had long to struggle with poverty. A picture of the Madonna, which O. painted at Rome 1811, brought him into notice, and he was employed, with Cornelius and his other friends, by the Prussian consul, Bartholdi, to execute for his house at Rome frescoes illustrating the history of Joseph—the *Selling of Joseph* and the *Seven Lean Years* being the subjects assigned to him. After completing these, he painted in fresco, in the villa of the Marchese Massimi, five large compositions from Tasso's *Jerusalem Delivered*. In 1813, with some of his artistic brethren, he abjured Lutheranism, and entered the Rom. Cath. Church. O.'s chief work is a fresco at Assisi, *The Vision of St. Francis*. His oil pictures are inferior to his frescoes, being dry and weak in color. Among his famous pictures are: *Christ's Entry into Jerusalem*, at Lübeck; *Christ's Agony in the Garden*, at Hamburg; *Lo Sposalizio*, at Berlin; the *Triumph of Religion in the Arts*, at Frankfurt; the *Incredulity of St. Thomas*, in a private house in London. He executed many drawings and cartoons remarkable for noble feeling, most of which, like his frescoes and paintings, have been engraved. One of his last undertakings, a series of designs from the evangelists, delicately engraved in the line manner, is a work of high excellence. O. adhered closely to those ideas of art with which he started—namely, entire devotion to the style of the Italian artists prior to the period of the renaissance—Fra Angelico, Pinturicchio, Perugino, and Raphael in his early period—and a conviction that drawing in the classic style is inadmissible in works embodying religious subjects. Among the characteristics of the art of the school are devout feeling, hardness of outline, scholastic composition, and the avoidance of merely sensuous beauty both in color and in form. The success of the school in fresco led to a notable revival of the long-neglected art. O. was a devout and saintly man. He wrote poems and essays, and a mass of letters on congenial topics. He died at Rome.

OVERBLOWN, pp. and a. *ō′vėr-blōn′:* exhausted; blown over.

OVERBOARD, ad. *ō′vėr-bōrd:* out of a ship or vessel, as, to fall *overboard;* from on board.

OVERBOIL, v. *ō′vėr-boyl′:* to boil unduly or excessively.

OVERBUILD, v. *ō′vėr-bĭld′:* to build beyond the demand.

OVERBULK, v. *ō′vėr-bŭlk′:* to oppress by bulk.

OVERBURDEN, v. *ō′vėr-bėr′dn*, or **OVERBURTHEN**, v. *-bėr′thĕn*, to load too heavily. **O′VERBUR′DENING**, imp. *-dn-ĭng*. **O′VERBUR′DENED**, pp. *-dnd:* ADJ. excessively loaded. **O′VERBUR′DENSOME**, a. *-dn-sŭm*, excessively loaded or burdened.

OVERBURY, *ō′vėr-bėr-ĭ*, Sir THOMAS: English author and courtier, whose mysterious death has given interest to his history: 1581–1613, Sep. 15; b. Compton Scorfen, Warwickshire; son of Nicholas O., a Gloucestershire squire. He studied at Oxford, graduating 1598; and joined the Middle Temple. Returning from a tour on the continent, with the reputation of a finished gentleman, he met in Scotland, 1601, Robert Carr (properly Ker), a page in the service of the Earl of Dunbar. Carr—a handsome ignoramus, sensual and unprincipled—unfortunately followed his scholarly friend to London. Carr soon gained the royal favor, and was created Viscount Rochester; and through his influence O. was knighted 1608.

Frances Howard, daughter of the Earl of Suffolk—who had been married (1606), at the age of 13, to the Earl of Essex, only a year older, and who had grown up as a splendid beauty, but utterly devoid of virtue or goodness—having had more than one love-intrigue at court—now cherished a fierce passion for Rochester. When Rochester proposed to get Lady Essex divorced from her husband, and then to marry her, O. (who had helped to bring about their illicit relation) protested that such a creature might do for a mistress, but not for a wife. Lady Essex, hearing of this, became furious for revenge, and offered an enemy of O., Sir David Wood, £1,000 to assassinate him, which offer was declined. Rochester, it has been held, though never proved, was persuaded by his mistress to join in a plot against O., who on a trivial pretext was thrown into the Tower 1613, Apr. 21. O., threatening to divulge certain secrets, was, after several attempts, poisoned. Rochester (now created Earl of Somerset) and his paramour were married Dec. 26, with great pomp. But after George Villiers had supplanted the earl in the royal favor, an inquiry was instituted; sentence of death was executed on four of those concerned in the plot; Somerset and his wife were tried and found guilty of poisoning, but were, by an amazing stretch of the royal prerogative, pardoned. Though the countess was unquestionably guilty, the complicity of Somerset himself was never proved. O. wrote several works, posthumously published: among them were, *The Wife* (1614), a didactic poem; *Characters* (1614), a work showing wit, ingenuity, precision, and force. See ed. of O.'s works, with Life, E. F. Rimbault, 1856.

OVERCANOPY, v. *ō′vėr-kăn′ō-pĭ:* to cover as with a canopy.

OVERCAREFUL, a. *ō′vėr-kār′fûl:* excessively careful.

OVERCAST, v. *ō′vėr-kăst′:* to spread over or darken, as with a cloud; to sew by running the thread over a rough edge. O′VERCAST′, pp. covered with gloom; sewed over. O′VERCAST′ING, imp. overspreading with gloom; sewing by running the thread over a rough edge.

OVERCAUTIOUS, a. *ō′vėr-kaw′shŭs:* prudent to excess. O′VERCAU′TIOUSLY, ad. *-lĭ.*

OVERCHARGE, v. *ō′vėr-chârj′:* to load or fill to excess; in an *account,* to demand more than is just; to exaggerate: N. *ō′vėr-chârj,* more than is just in an account; an excessive loading, as in a gun. O′VERCHARG′ING, imp. O′VERCHARGED′, pp. *-chârjd′:* ADJ. loaded to excess; charged more than is just.

OVERCLOUD, v. *ō′vėr-klowd′:* to obscure with clouds.

OVERCLOY, v. *ō′vėr-kloy′:* to fill even beyond satiety.

OVERCOAT, n. *ō′vėr-kōt:* a topcoat; a greatcoat.

OVERCOME, v. *ō′vėr-kŭm′:* to vanquish; to subdue; to master; to get the better of; to be victorious; in *OE.*, to invade suddenly; to come over. O′VERCOM′ING, imp.: ADJ. subduing; getting the better of. O′VERCAME′, pt. *-kām′,* did overcome. O′VERCOME′, pp.—SYN. of 'overcome:' to subdue; beat; vanquish; conquer; surmount; overflow; overpower; overthrow; overturn; defeat; overbear; crush; prostrate; overwhelm.

OVERCOUNT, v. *ō′vėr-kownt′:* to rate above the true value.

OVERCOVER, v. *ō′vėr-kŭv′ėr:* to cover completely.

OVERCREDULOUS, a. *ō′vėr-krĕd′ū-lŭs:* too ready to believe.

OVERCROW, v. *ō′vėr-krō′:* in *OE.*, to crow as in triumph.

OVERCROWD, v. *ō′vėr-krowd′:* to put excessive numbers on or into, that is, beyond what safety or health will warrant. O′VERCROWD′ING, imp. O′VERCROWD′ED, pp.

OVER DARWEN, *ō'vėr dâr'wĕn* (postal designation, DARWEN): flourishing municipal borough and township of Lancashire, England; amid moorland hills, 3½ m. s. of Blackburn, 19½ m. n.w. of Manchester. Its prosperity has been due chiefly to the abundance of coal, stone, and water in the locality. Cotton manufacture is the staple industry. The 'India Mill,' erected to contain 100,000 spindles, is a stone building in the Italian style, with engine-house, chimney, etc., highly ornamented. The town contains the most extensive paper-staining works in England, several paper manufactories, a calico-printing establishment, and works for manufacture of fire-bricks, tiles, and drain tubes, iron and brass founding, bleaching, machine and reed making. Coal mines and stone quarries give employment to many of the inhabitants. There are several club-houses, a covered market, public baths, and a free library. The central stores of the Industrial Co-operative Soc., erected 1867, at a cost of £10,000, contain a large public hall; and the society maintains science classes, an extensive library, and well-supplied news-rooms. Pop. (1851) 11,702; (1861) 16,492; (1871) 21,278; (1881) 29,747.

OVERDELICATE, a. *ō'vėr-dĕl'ĭ-kāt:* nice or dainty to excess.

OVERDIGHT, pp. adj. *ō'vėr-dīt* [OE. *dight*—from AS. *dihtan*, to set in order: Ger. *dichten*, to contrive, to compose]: in *OE.*, dressed or adorned too much; covered over.

OVERDO, v. *ō'vėr-dô':* to perform or labor to excess; to fatigue; to cook overmuch. O'VERDO'ING, imp. O'VERDONE', pp. *-dŭn'*, acted to excess; baked or cooked too much.

OVERDOSE, n. *ō'vėr-dōs:* too much at one time of anything: V. *-dōs'*, to give too great a dose.

OVERDRAW, v. *ō'vėr-draw':* to take out of bank beyond the amount standing to one's credit; to exaggerate. O'VERDRAWN', pp. a. *-drawn'*, exaggerated, as, an overdrawn statement or description.

OVERDRESS, v. *ō'vėr-drĕs':* to dress too finely or gaudily; to dress to excess.

OVERDRIVE, v. *ō'vėr-drīv':* to drive beyond strength. O'VERDRIV'EN, pp. *-drĭv'n.*

OVERDUE, a. *ō'vėr-dū':* past the time of payment.

OVEREAGER, a. *ō'vėr-ē'gėr:* too eager; too vehement in desire. O'VEREA'GERLY, ad. *-lĭ.* O'VEREA'GERNESS, n. *-nĕs*, excess of eagerness.

OVERESTIMATE, v. *ō'vėr-ĕs'tĭ-māt:* to value too highly: N. too high a value.

OVEREXCITED, a. *ō'vėr-ĕk-sī'tĕd:* excited to excess. O'VEREXCITE'MENT, n. excitement to excess.

OVEREYE, v. *ō'vėr-ī:* in *OE.*, to remark; to observe.

OVERFATIGUE, n. *ō'vėr-fă-tēg':* too much fatigue: V. to fatigue to excess; to weary out.

OVERFLOW, v. *ō′vėr-flō′:* to fill beyond the brim; to cover with water; to be fuller than to the brim; to run over; to abound: N. *ō-vėr-flō′*, a superabundance; an inundation. O′VERFLOW′ING, imp. O′VERFLOWED′, pp. *-flōd′*.

OVERFOND, a. *ō′vėr-fŏnd:* fond to excess. O′VERFOND′LY, ad. *-lĭ*. O′VERFOND′NESS, too much fondness.

OVERFREE, a. *ō′vėr-frē′:* free to excess; too liberal; too familiar. O′VERFREE′LY, ad. *-lĭ*.

OVERFREIGHT, v. *ō′vėr-frāt′:* to load with too great a burden; to fill too full. O′VERFREIGHT′ED, pt. pp., or O′VERFRAUGHT′, *-frawt′*, filled with too great a quantity.

OVERFULL, a. *ō′vėr-fûl′:* full to excess.

OVERGONE, pp. *ō′vėr-gŏn′:* OE. for ‘foregone’.

OVERGORGE, v. *ō′vėr-gŏrj′:* to gorge too much.

OVERGREEDY, a. *ō′vėr-grē′dĭ:* excessively greedy.

OVERGROW, v. *ō′vėr-grō′:* to rise above; to grow beyond the usual or natural size. O′VERGROW′ING, imp. O′VERGROWN′, pp. *-grōn′:* ADJ. increased beyond a natural size. O′VERGROWTH, n. *-grōth*, excessive growth.

OVERHAILE, v. *ō′vėr-hāl′* [OE. *haile*, hauled, drawn: Dut. *haelen*, to fetch, to draw]: in *OE.*, to haul or draw over.

OVERHANDLE, v. *ō′vėr-hăn′dl:* in *OE.*, to mention or treat of too often.

OVERHANG, v. *ō′vėr-hăng′:* to jut or project over. O′VERHANG′ING, imp.: ADJ. hanging over or above. O′VERHUNG, pp. hung over; covered or overcast.

OVERHAUL, v. *ō′vėr-hawl′:* to examine or inspect; to re-examine, as accounts. O′VERHAUL′ING, imp. O′VERHAULED′, pp. *-hawld′*, said of a ship when she is overtaken by another in a chase at sea, as by an enemy or by a govt. vessel for examination.

OVERHEAD, ad. *ō′vėr-hĕd:* above; aloft; in the story or ceiling above; without distinction: ADJ. in *Scot.*, expressing the whole without any separation of parts, as *overhead* flour.

OVERHEAR, v. *ō′vėr-hēr′:* to hear what is not intended to be heard by one; to hear by accident. O′VERHEARD′, pp. *-hėrd′*.

OVERHEND, v. *ō′vėr-hĕnd′* [OE. *hend*, to take—from Icel. *henda*, to seize]: in *OE.*, to overtake; to reach. O′VERHENT′, pt. pp. overtaken; reached.

OVERISSUE, v. *ō′vėr-ĭsh′shū:* to put into circulation a number beyond that authorized, as a bank with their bank-notes; to put into circulation a number beyond that dictated by prudence and ability to pay, as commercial bills of exchange: N. an excessive issue.

OVERJOY, v. *ō′vėr-joy′:* to fill with exceeding pleasure and delight; to transport with gladness: N. transport; ecstasy. O′VERJOYED′, pp. *-joyd′*, filled with exceeding pleasure and delight.

OVERLADE, v. *ō′vėr-lād′:* to load with too great a cargo or burden. O′VERLA′DING, imp. O′VERLA′DEN, pp. *-lā′dn:* ADJ. loaded with too great a cargo or burden.

OVERLAID: see OVERLAY.

OVERLAND, a. *ō′vėr-lănd:* journeying by land, or chiefly by land.

O′VERLAND ROUTE to India: route of about 6,000 m., from England across the continent of Europe and the Isthmus of Suez; about half as long as the voyage round by the Cape of Good Hope, and occupying one-third to one-half the time. The most direct overland route is from London, by Calais, through the Mont Cenis or St. Gothard Tunnel, by rail to Brindisi, thence to Port Said by steamer, and through the Suez canal and Red Sea to Bombay; time, 21 days. A longer route is to Marseilles, Trieste, or Naples, thence to Alexandria or Port Said. The O. R. communication is mainly by the Peninsular and Oriental Company, incorporated 1840. The railway from Suez to Alexandria, by Cairo, was opened 1858; the Suez canal 1869. Passengers who dislike the fatiguing railway journey to Brindisi may embark at London and sail by Gibraltarand Malta, through the canal, to Bombay —now the usual route for merchandise. From Bombay there is railway to Madras and Calcutta; or steamers by the Point de Galle, whence other steamers run to Singapore, Shanghai, Yokohama, etc.; also to the Australian ports. The Orient and other lines of steamers, with slightly varying routes, have rendered the voyage to Australia by the Suez canal very short, compared with its former length. The Euphrates valley railway, if ever constructed, would take its place as part of an O. R. Another scheme for simplifying the voyage to India is by a canal connecting the Jordan valley with the Mediterranean on the one hand, and with the Gulf of Akabah, a branch of the Red Sea, on the other. Swift and direct communication with India is of enormous importance to Britain for military and imperial, as well as commercial, reasons: hence the peculiar interest of the British govt. in Egyptian affairs.

OVERLAP, n. *ō′vėr-lăp′:* in *geol.*, a term used to express that extension or spread of higher strata by which they conceal the edges of those on which they rest: V. to lap or fold over, as when the margin of one thing covers that of another. O′VERLAP′PING, imp. lying one over another, as the slates or tiles on a roof. O′VERLAPPED′, pp. *-lăpt′.*

OVERLARGE, a. *ō′vėr-lârj:* larger than enough.

OVERLAY, v. *ō′vėr-lā′:* to lay too much weight upon; to cover on the surface, as with a metal; to smother by lying upon; to join by a cover or folding over, as two sides of a thing, one over the other. O′VERLAY′ING, imp.: N. a laying or spreading over; a superficial covering. O′VERLAID′, pp. *-lād′*, covered over; smothered.

OVERLEAVEN, v. *ō′vėr-lĕv′n:* to swell out too much; to corrupt.

OVERLIE, v. *ō′vėr-lī′:* to lie above or upon. O′VERLY′ING, imp.: ADJ. resting over or upon something. O′VERLAID′, pp. *-lād′.*

OVERLIVE, v. *ō′vėr-lĭv′:* to live longer than another; to outlive; to survive; to live too long.

OVERLOAD, v. *ō′vėr-lōd′:* to fill with too heavy a burden, or to excess; to put too heavy a burden on. O′VERLOAD′ING, imp. O′VERLOAD′ED, pp.

OVERLONG, ad. *ō′vėr-lŏng′:* too long.

OVERLOOK, v. *ō′vėr-lûk′:* to view from higher ground; to stand on higher ground; to inspect; to superintend; to review; to pass by indulgently; to neglect. O′VERLOOK′ING, imp. O′VERLOOKED′, pp. *-lûkt′.* O′VERLOOK′ER, n. *-ėr,* one who overlooks; a superintendent.

OVERLOUD, a. *ō′vėr-lowd:* too loud.

OVERLYING: see OVERLIE.

OVERMASTED, a. *ō′rėr-mâs′tĕd:* having masts too long or heavy.

OVERMASTER, v. *ō′vėr-mâs′tėr:* to bring into subjection; to govern.

OVERMATCH, v. *ō′rėr-măch′:* to conquer; to be too powerful; to subdue: N. one able to overcome.

OVERMUCH, a. *ō′vėr-mŭch′:* more than necessary: AD. in too great a degree.

OVERNICE, a. *ō′vėr-nīs′:* excessively nice; fastidious. O′VERNICE′NESS, n. *-nĕs,* state of being excessively nice.

OVERNIGHT, n. *ō′rėr-nīt′:* the time when evening is past and night is begun; the night or evening before, as, he came *overnight:* AD. during the night previous; last night.

OVERPAID: see OVERPAY.

OVERPASS, v. *ō′vėr-pâs′:* to neglect; to overlook; to omit; to pass away; to cross or go over, as, he overpassed the limits, etc. O′VERPASS′ING, imp. O′VERPASSED′, or O′VERPAST′, pp. *-pâst′,* passed over or by; passed away; gone.

OVERPAY, v. *ō′vėr-pā′:* to pay too much; to reward more than is due. O′VERPAY′ING, imp. O′VERPAID′, pp. *-pād′.*

OVERPEER, v. *ō′vėr-pēr′:* in *OE.,* to hang or hover above; to overlook.

OVERPEOPLED, a. *ō′vėr-pē′pld:* having too many inhabitants.

OVERPERCH, v. *ō′vėr-pėrch′:* in *OE.,* to fly over.

OVERPICTURE, v. *ō′vėr-pĭk′tūr:* in *OE.,* to exceed the picture or representation.

OVERPLUS, n. *ō′vėr-plŭs* [*over,* and L. *plus,* more]: that which is over and above; what remains after a proposed quantity.

OVERPOST, v. *ō′vėr-pōst′:* to get quickly over.

OVERPOWER, v. *ō′vėr-pow′r:* to bear down or crush by superior force; to oppress by a power greater than can be borne; to vanquish. O′VERPOW′ERING, imp.: ADJ. bearing down by superior force; subduing; crushing. O′VERPOW′ERED, pp. *-pow′rd.* O′VERPOW′ERINGLY, ad. *-lĭ.*—SYN. of 'overpower': to overbear; overwhelm; overcome; conquer; crush; defeat; rout; overthrow; subdue.

OVERPRESS, v. *ō′vėr-prĕs′:* to bear upon with irresistible force; to crush.

OVERPRODUCTION, n. *ō′vėr-prō-dŭk′shŭn:* excessive production; supply beyond actual demand.

OVERRATE, v. *ō′vėr-rāt′:* to estimate at too high a value. O′VERRA′TING, imp. O′VERRA′TED, pp.

OVERREACH, v. *ō′vėr-rēch′:* to extend or reach beyond; to get the better of by cunning; to cheat; to bring the hinder feet too far forward, and strike them against the foreshoes, as a horse is apt sometimes to do. O′VERREACH′ING, imp.: ADJ. cheating: N. the act of cheating by cunning. O′VERREACHED′, pp. *-rēcht′.* O′VERREACH′ER, n. one who cheats.

OVERREAD, v. *ō′vėr-rēd′:* to peruse.

OVERRED, v. *ō′vėr-rĕd′:* to cover with a red color; to redden.

OVERREFINE, v. *ō′vėr-rĕ-fīn′:* to refine with too great subtlety.

OVERRIDE, v. *ō′vėr-rīd′:* to ride beyond the strength of the horse. O′VERRI′DING, imp. O′VERRID′DEN, pp. *-rĭd′n,* ridden to excess. TO OVERRIDE ONE'S COMMISSION OR POWER, to go beyond one's power or authority; to use such arrogantly.

OVERRIPE, a. *ō′vėr-rīp′:* matured to excess. O′VERRI′PEN, v. *-rī′pn,* to make too ripe.

OVERRULE, v. *ō′vėr-rôl′:* to control by superior authority; to influence and control by irresistible power; to supersede or reject, as, the plea was *overruled.* O′VERRU′LING, imp.: ADJ. exerting superior and controlling power. O′VERRULED′, pp. *-rôld′.*

OVERRUN, v. *ō′vėr-rŭn′:* to cover all over; to spread over and take possession of; to grow all over or to excess, as noxious plants in a district of country; to rove over in a hostile manner; to ravage; to overflow; in *printing,* to change the disposition of types by carrying those of one line into another; to carry over one or more lines from one page to another. O′VERRUN′NING, imp.: ADJ. spreading over; ravaging. O′VERRAN′, pt. *-răn′.* O′VERRUN′, pp. *-rŭn′,* grown over; ravaged.

OVERSCRUPULOUS, a. *ō′vėr-skrô′pū-lŭs:* too nice or exact.

OVER-SEA, a. *ō′vėr-sē′:* foreign; from beyond the sea: AD. abroad.

OVERSEE, v. *ŏ′vėr-sē̆′:* to superintend; to inspect with care. O′VERSEER′, n. *-sēr′*, one who superintends or manages an establishment, or some department of it; a parish officer who superintends the parochial provision for its paupers (see below). O′VERSEE′ING, imp. overlooking or superintending.

OVERSEERS, *ŏ′vėr-sērz′* or *-sē̆′ėrz:* officers appointed annually, in all the parishes in England and Wales, whose primary duty it is to rate the inhabitants to the poor-rate, collect the same, and apply it to relief for the poor. These officers have important functions in all English parishes. They were ordered to be appointed in each parish first in the reign of Elizabeth. Only householders in the parish are qualified for the office: nomination is usually by the vestry; and appointment always by the justices of the peace. The O. number for each parish two to four. All persons not specially exempted by some statute are liable to serve; even women may be appointed, though they scarcely ever are. The office is compulsory, and entirely without pay: it is an indictable misdemeanor to refuse, without cause, to serve when duly appointed. In some exceptional parishes, and under poor-law unions, the relief of the poor is committed mainly to other officials by local statutes; but, on the other hand, advantage has been taken by the legislature of the existence of the O., always representing the parish, to throw on them miscellaneous duties not directly connected with poor-law affairs.

1. In functions connected with the management of the poor, the O., with the church-wardens, make, once or twice a year, a list of all occupiers of lands and houses in the parish, the property occupied by each, and the ratable amount due by each: they collect and apply the money toward relief of the poor, and kindred purposes. Relief must be given to all the destitute; but a pauper not having a settlement in the parish is removed under legal process to the parish where he has a settlement: see REMOVAL OF PAUPERS. Relief is given, in general, only in the workhouse, and according to certain rules and conditions. Where the parish is included in a poor-law union, as is now generally the case, then the duty of O. in giving relief is confined to urgent cases; since the guardians of the union administer the ordinary business of the workhouse, and of relief generally.

2. Numerous miscellaneous duties are now imposed by statute on O., besides their original duty of relieving the poor. Prominent is that of making out the list of voters in the parish, for members of parliament. Other duties are to make out the list of persons qualified to serve as jurors, the burgess lists when the parish is within a borough, and the list of persons qualified to serve as parish constables. The O. also appoint persons to enforce the Vaccination Acts, give notice to justices of all lunatics within the parish, collect and enforce payment of rates levied for expenses of school-boards, and perform certain duties as to the election of guardians

for the union. They must also bury the dead bodies of persons cast on shore, and of paupers who die in the parish. They must protect village greens from nuisances; and in general act as a board of health (when no such board exists) in the parish (see Nuisance).—In the larger parishes, the O. are generally relieved of their burdensome office to some extent by appointment by the ratepayers of an *Assistant Overseer*, a payed official.—The duties which in England are performed by O. devolve, in Scotland, on the parochial board, the sheriff-clerk of the county, session-clerk, and others.—For the care of the poor in the United States and other countries, see Poor, The.

OVERSET, v. *ō'vėr-sĕt':* to turn upon the side, or with bottom upward; to overthrow; to subvert; to be turned over. O'verset'ting, imp. upsetting; turning upside-down; overthrowing; subverting.

OVERSHADOW, v. *ō'vėr-shăd'ō:* to shelter or protect; to cover with superior influence; to throw a shadow over anything. O'vershad'owing, imp. O'vershad'owed, pp. *-ōd.*

OVERSHOE, n. *ō'vėr-shô:* a shoe worn over another—applied to a shoe of waterproof material; a golosh. See Overshoes, India-rubber.

O'VERSHOES, In'dia-rub'ber: footwear for protection against wet; called Goloshes (q.v.) in Great Britain, where they were introduced from America about 1847; though it was some time after this before the trade in them reached much importance, as at first they were clumsily made, and of inferior quality. However, mainly by the exertions of the Hayward Rubber Company in the United States, their quality and appearance were soon much improved, and the demand for them increased rapidly. Many mills for their production were then started in the United States, and several in Great Britain, France, Germany, and Russia. In the populous districts of Great Britain, the demand for these shoes now is not a fifth part of what it was 15 or 20 years ago.

These shoes tend to keep the stockings damp, and the feet uncomfortable, by preventing escape or absorption of perspiration: even when the uppers are almost entirely of some woven texture, and nothing but the sole of vulcanized rubber, they are not wholly free from this fault. Most kinds of rubber shoes have their separate pieces held together entirely by the adhesiveness of the rubber when treated by some solvent, such as turpentine; therefore there are no seams like those in a leather shoe, and this, with the close texture of the rubber itself, is the cause of the discomfort. Their good qualities are their imperviousness to damp, as well as their softness and durability.

The material for this manufacture is prepared by processes in general as follows: (1) the rubber is torn into small pieces, washed, and rolled together in granulated sheets; (2) it is then mixed, by the aid of heated rollers, with the vulcanizing materials, consisting of sulphur, litharge, lampblack, pitch, rosin, and sometimes other substances: (3) the final treatment of the material is after the shoes are made, and consists in subjecting them for nine hours to a temperature of 200° to 300° F. Rubber so treated is said to be vulcanized—for the properties of which, see CAOUTCHOUC. After the rubber is thoroughly mixed with the materials above mentioned, of which sulphur is the most essential, the so-far prepared sheets of material are again rolled out between the heated rollers, till they are of the required thickness for the shoe uppers. For this purpose, the rollers, which are fitted into machines called calenders, are very carefully adjusted. The sheets for the soles are made in the same way; only, in their case, the rollers are so constructed as to produce a certain breadth for the heels of an extra thickness, and to indent the surface with grooves, to prevent slipping. Both soles and uppers for each shoe are cut out separately with a knife, since the material will not admit of a number of these being cut at a time by dies, which, however, is done in the case of the linings, as they are of cotton or wool, and will not stick together by pressure. Thin metal molds are used by the workmen for shaping the separate parts of a shoe—i.e., the rubber parts. The calico or other linings are coated round the edges with some strongly adhesive cement, probably dissolved rubber, and then all the pieces are ready to be put together.

All the work to this stage has been done by men; but women with nimble fingers make the shoes. The lasts are of hollow cast-iron, and some manufacturing companies have many thousand pairs of them. Working with a number of lasts exactly the same, the girl first covers them with the various pieces of lining and insole, all of which are held together by the cement. Returning to the first one, she puts on the various outer pieces of the shoe, sticking them together quickly with a little turpentine at the junctions; and then by way of ornament, still more quickly, runs a small notched wheel along where the seams in a leather shoe are, to finish her work. A clever girl will make 50 pairs a day; a very clever one, 70—i.e., a pair of shoes in 10 or 12 minutes. The next process is to coat the shoes with a varnish which gives them a gloss, and in this the manufacturers aim to excel. Finally, they are put on light iron frames, and exposed to the heat of the vulcanizing chamber. Many distinct kinds of India-rubber boots and shoes are made. Some are very light and low, covering scarcely more than the sole and the toe of the upper; others, for cold climates, have warm felt linings and cover to the ankle.

OVERSHOOT, v. *ō'vėr-shôt':* to shoot beyond the target; to pass swiftly over; to venture too far, as to overshoot one's self; to fly beyond the mark. O'VERSHOT', pp. *-shŏt':* ADJ. having the water falling from above, as on the wheel of a mill driven by water.

OVERSIGHT, n. *ō′vėr-sīt:* a failing to notice; a mistake or neglect; an omission; an inadvertence; superintendence.—SYN.: supervision; inspection; inattention; error.

OVERSIZED, a. *ō′vėr-sīzd′* [*size*, a preparatory coating for walls]: smeared or covered over with too much size.

OVERSKIP, v. *ō′vėr-skĭp′:* to pass by leaping; to escape.

OVERSLEEP, v. *ō′vėr-slēp′:* to sleep too long.

OVERSMAN, n. *ō′vėrz-măn* [*over's*, and *man*]: an overseer or superintendent; in *Scotch law*, an umpire; one appointed to decide where two or more cannot agree on a decision.

OVERSOON, ad. *ō′vėr-sôn′:* too soon.

OVERSPREAD, v. *ō′vėr-sprĕd′:* to cover or scatter over; to be scattered over.

OVERSTATE, v. *ō′vėr-stāt′:* to state in too strong terms; to exaggerate.

OVERSTEP, v. *ō′vėr-stĕp′:* to exceed. O′VERSTEP′PING, imp. exceeding proper bounds. O′VERSTEPPED′, pp. *-stĕpt′*.

OVERSTOCK, v. *ō′vėr-stŏk′:* to supply with more than is wanted or necessary. O′VERSTOCK′ING, imp. O′VERSTOCKED′, pp. *-stŏkt′*.

OVERSTONE, *ō′vėr-ston*, SAMUEL JONES LOYD, Lord: one of the most skilful political economists, and the ablest writer on banking and financial subjects that Britain has produced: 1796–1883, Nov. 17; descended from a respectable Welsh family. He was educated at Eton and Cambridge, gaining a thorough knowledge of the classics and of English history and literature. He entered his father's banking-house as a partner, and on his father's retirement he became its head. He had a profound knowledge of the principles of banking, and was far-sighted and sagacious—sometimes perhaps too cautious, but neither timid nor irresolute. He was eminently successful. Loyd entered parliament 1819 as member for Hythe, for which he sat till 1826. Though opposed to all revolutionary changes, he was always a consistent liberal. He was raised to the peerage 1850, with the title Baron Overstone and Fotheringhay, county Northampton.

The first of Lord O.'s famous tracts on the management of the bank of England and the state of the currency was published 1837, and was followed by others till 1857, in which year all were collected and published, with his other financial writings. The proposal of a complete separation between the banking and issue departments of the bank of England, introduced by Sir Robert Peel into the act of 1844, was brought forward first in these tracts: its adoption has been the greatest improvement hitherto in English banking. Lord O. also reprinted, at his own expense, four vols. of scarce and valuable tracts on metallic and paper money, commerce, the funding system, etc. Before a committee of the house of commons 1857, Lord O. successfully vindicated the principles and practical working of the act of 1844: his evidence was published 1857.

Lord O. was a zealous opponent of the principle of limited liability, and of the introduction of a decimal system of arithmetic. He was chairman of the Irish Famine Committee 1847, a trustee of the National Gallery 1850, and one of the senators of the Univ. of London. At his death, he left personal estate of more than £2,000,000.

OVERSTRAIN, v. *ō′vėr-strān′:* to stretch too much or too far; to make too violent efforts. O′VERSTRAIN′ING, imp. O′VERSTRAINED′, pp. *-strānd′:* ADJ. strained or stretched beyond the proper limits.

OVERSUPPLY, n. *ō′vėr-sŭp-plī′:* an excessive supply; a supply beyond demand.

OVERSWAY, v. *ō′vėr-swā′:* to overrule; to bear down.

OVERT, a. *ō′vėrt* [OF. *overt;* F. *ouvert*, open—from L. *apertus*, uncovered]: open to view; public; apparent; manifest: in *her.*, a term applied to the wings of birds, etc., when spread open on either side of the head, as if taking flight. O′VERTLY, ad. *-lĭ.*

OVERTAKE, v. *ō′vėr-tāk′:* to come up with, as in pursuit or progress; to catch; to come upon, as punishment; to take by surprise. O′VERTA′KING, imp. O′VERTOOK′, pt. *-tûk′.* O′VERTA′KEN, pp. *-tā′kn*, come up with; caught.

OVERTASK, v. *ō′vėr-tâsk′:* to require too much labor from, either mental or physical. O′VERTASK′ING, imp. O′VERTASKED′, pp. *-tâskt′.*

OVERTAX, v. *ō′vėr-tăks′:* to tax too heavily.

OVERTHROW, v. *ō′vėr-thrō′:* to turn upside down; to upset; to demolish; to vanquish; to destroy: N. *ō′vėr-thrō*, defeat; downfall; ruin. O′VERTHROW′ING, imp. O′VERTHREW′, pt. *-thrô′.* O′VERTHROWN′, pp. *-thrōn′.*—SYN. of ‘overthrow, v.’: to ruin; defeat; conquer; vanquish; subvert; discomfit; degrade; overturn; prostrate; overcome; rout.

OVERTIME, n. *ō′vėr-tīm:* time employed in labor beyond the usual hour.

OVERTON, *ō′vėr-ton:* parliamentary borough and parish in Flintshire, N. Wales, on the river Dee, 20 m. n.n.w. of Shrewsbury. It is the polling-place for the county. —O. is the name also of villages in Hants, Lancashire, and Wiltshire, and of a parish in Yorkshire, England, and in Lanarkshire, Scotland.

OVERTONES, n. plu. *ō′vėr-tōns:* smaller vibrations which accompany a fundamental note; harmonics.

OVERTOOK: see OVERTAKE.

OVERTOP, v. *ō′vėr-tŏp′:* to rise above; to raise the head above; to surpass; to excel; *figuratively*, to obscure by rising above. O′VERTOP′PING, imp. O′VERTOPPED′, pp. *-tŏpt′.*

OVERTRADE, v. *ō'vėr-trād':* to purchase goods beyond the means of payment, or beyond the wants of the public; to trade beyond one's capital. O'VERTRA'DING, imp.: N. the speculative purchasing of goods beyond the means of payment; the act of glutting the market.

OVERTURE, n. *ō'vėr-tūr* [OF. *overture;* F. *ouverture,* an overture or opening, an entrance, a motion made—from L. *apertus,* uncovered]: *literally,* an opening; a manifestation; a beginning; a proposal; something offered for consideration or acceptance; the instrumental music performed before the commencement of an opera, etc. (see below): in *OE.,* an open unprotected place; a discovery; a disclosure: V. in *Scot.,* in the Presb. churches, to transmit for consideration and acceptance, in a formal writing, some measure deemed of importance, from a lower to a higher ecclesiastical court: N. the document so transmitted, which, when received by the general assembly of the Scotch Church from a presbytery, may be transmitted by it to other presbyteries, for their consideration, before being finally adjudicated on. O'VERTURING, imp. O'VERTURED, pp. *-tūrd.*

O'VERTURE: in music, a composition for a full instrumental band, introductory to an opera, oratorio, cantata, or ballet. It originated in France, and received its settled form at the hands of Lulli. Being of the nature of a prologue, it ought to be in keeping with the piece which it ushers in, preparing the audience for the sort of emotions which the author wishes to excite—e.g., the beautiful overtures by Mozart to *Zauberflöte* and *Don Giovanni,* by Weber to *Freischütz,* and by Mendelssohn to his *Midsummer Night's Dream,* which are enriched by snatches of the more prominent airs in these operas. In the end of the 18th c., overtures were written by Haydn, Pleyel, and other composers, as independent pieces to be played in the concert-room: this sort of O. was the early form of what was afterward developed into the SYMPHONY (q.v.). The O., as well as the symphony, is designated in Italian by the name *sinfonia.*

OVERTURN, v. *ō'vėr-tėrn':* to subvert or overthrow: N. the state of being overthrown or subverted. O'VERTURN'ING, imp. O'VERTURNED', pp. *-tėrnd'.*—SYN. of 'overturn': see OVERTHROW.

OVERVALUE, v. *ō'vėr-văl'ū:* to rate at too high a price.

OVERWEATHER, v. *ō'vėr-wĕth'ėr:* in *OE.,* to batter by the violence of the weather.

OVERWEEN, v. *ō'vėr-wēn':* to think too highly or conceitedly. O'VERWEEN'ING, imp.: ADJ. that thinks too highly; conceited; vain. O'VERWEEN'INGLY, ad. *-lĭ.*

OVERWEG, *ō′vėr-văch*, ADOLF: German traveller: 1822, July 24—1852, Sep. 27; b. at Hamburg. He studied nat. science at Bonn and Berlin, and 1850 accompanied Barth and Richardson on their expedition to central Africa. It was from his observations chiefly that our knowledge of the levels of the Sahara is derived. Alone he explored great part of Lake Tchad, and alone or with others examined various tributaries of that lake, and the country watered by them. He died near the lake.

OVERWEIGH, v. *ō′vėr-wā′:* to exceed in weight; to overbalance. O′VERWEIGH′ING, imp. O′VERWEIGHED′, pp. *-wād′*. O′VERWEIGHT, n. *-wāt*, a greater weight; a weight beyond the prescribed or legal weight.

OVERWHELM, v. *ō′vėr-hwĕlm′:* to crush with something that covers or embraces the whole; to submerge or immerse; to overpower or subdue. O′VERWHELM′ING, imp.: ADJ. overpowering or crushing with weight or numbers; crushing. O′VERWHELMED′, pp. *-hwĕlmd′*. O′VERWHELM′INGLY, ad. *-lĭ*.

OVERWISE, a. *ō′vėr-wīz′:* affectedly wise. O′VERWISE′LY, ad. *-lĭ*.

OVERWORK, n. *ō′vėr-wėrk:* excessive labor: V. *ō′vėr-wėrk′*, to labor or cause to labor beyond strength or capacity; to tire. O′VERWORK′ING, imp. O′VERWORKED′, pp. *-wėrkt′*, or O′VERWROUGHT′, pp. a. *-rawt′*, labored to excess; worked so as to fatigue and exhaust; worked all over, as with ornaments.

OVERWORN, a. *ō′vėr-wōrn:* worn to excess.

OVERWROUGHT: see under OVERWORK.

OVERYSSEL, or OVERIJSSEL, *ō-vėr-ĭs′sĕl:* province of the Netherlands, bounded n. by Friesland and Drenthe, e. by Hanover and Westphalia, s. and s.w. by Gelderland, w. by the Zuyder Zee; 1,291 sq. m. The soil is sandy, with clay lands by the Yssel, rich pastures along the Zuyder Zee and rivers, tracts of peat-land in various parts, and extensive heaths gradually being brought into cultivation. From s. to n., the province is intersected by an unbroken chain of sand-hills. The chief cities are Zwolle (pop. [1872] 22,759), Deventer (pop. 19,162), and Kampen (pop. 17,444); important manufacturing towns of less note being Almelo, Avereest, Dalfsen, Haaksbergen, Hardenberg, Hellendorn, Lonneker, Losser, Raalte, Staphorst, Steenwykerwold, etc. The principal employments are agriculture, manufactures of various kinds, fishing, making peat, shipping, and merchandise. Carpets are manufactured at Deventer and Kampen, leather at Blokzyl, calicoes and other cotton fabrics at Kampen, Almelo, Dalfsen, Ommen, and many other towns. There are extensive brickworks at Ryssen, Zwollerkerspel, Markelo, and Diepenveen, producing a yearly aggregate of 43,760,000. Shipbuilding is carried on at Zwartsluis, Vollenhove, Steenwykerwold, and elsewhere.—The principal rivers are the Yssel, into which the Schipbeek runs, and the Overysselsche Vecht, which falls into the Black Water. Other important waterways are the Dedems-Vaart and the Willems-Vaart canals. There were (1873) 109 m. of railways. The island of Schokland, in the Zuyder Zee, belongs to O. Pop. of province (1859) 234,376; (1880) 276,246.

OVERZEALOUS, a. *ō'vėr-zĕl'ŭs:* eager to excess.

O'VIBOS: see MUSK OX.

OVICULAR, a. *ō-vĭk'ū-lėr* [L. *ovum*, an egg]: pertaining to an egg; egg-shaped.

OVID, *ŏv'ĭd* (PUBLIUS OVIDIUS NASO): latest of the distinguished poets of the Augustan age: B.C. 43, Mar. 20—A.D. 17; b. Sulmo, in the country of the Peligni, a mountain people; descendant of an old equestrian family. His birth was in the last year of the republic, and in the year of Cicero's death. He was educated for the bar, and became proficient in declamation. His genius, however, was essentially poetic. His father, having but a scanty patrimony to divide between two sons, discouraged the tendency in the younger to write verses, but in vain. O. went, for completion of his education, to Athens, where he acquired a perfect mastery of the Greek language. He afterward made a tour in Asia and Sicily with the poet Macer. It is uncertain whether, on his return to Rome, he ever practiced as advocate. Although by birth entitled to aspire to the dignity, he never entered the senate; his weakness of body and indolence of habit prevented him from ever rising higher than from the position of triumvir capitalis to that of a decemvir, who convened and presided over the court of the centumviri. O.'s private life was that of a gay and licentious man of elegant culture and literary tastes. The restraint of the matrimonial tie was always distasteful to him; twice married in early life, he soon divorced each of his wives; while he carried on an intrigue with a lady whom he celebrated as Corinna, whose social position is not known. Before his 30th year, he married a third time, and became the father of Perilla, of whom he was tenderly fond. Till his 50th year, he resided chiefly at Rome, in a house near the capitol, and occasionally visited his Pelignan estate. His society was much courted, and his large circle of distinguished friends included some members of the imperial family. By an edict of the emperor, however, he was, A.D. 9, commanded to leave Rome for Tomi, a town near the delta of the Danube, and on the very limit of the empire. The sentence did not condemn him to an *exsilium*, but to a *relegatio*—or, in other words, he did not lose his citizenship and property, nor was he cut off from all hope of return. The cause of this sudden banishment has long divided the opinion of scholars, since the one mentioned in the edict—the publication of his *Ars Amatoria*—seems strangely out of date, the poem having been in circulation ten years before. The intrigue of Julia, daughter of the emperor, with Iulius Antonius, son of Mark Antony, was a scandal contemporaneous with the publication of *Ars Amatoria*; and that most demoralizing of books may have seemed to the emperor the glorification by literary art of the corruption which had penetrated the whole Roman social life. Especially may his long-slumbering anger have been aroused against the poet by the second scandal of the intrigue of his granddaughter Julia with Silanus, with which affair, so humiliating to Augustus, O. seems to have had some connection as a confidential friend. The misery of O.'s life on the inhospitable and barbarous shore of the Euxine is commemorated by the poems in the composition of which he found his solace. He became a favorite with the Tomitæ, whose language he learned, and before whom he publicly recited some poems in honor of Augustus. But his devotion to the emperor, and the entreaties addressed to the imperial court by himself and his friends, failed to shorten the term or to change the scene of his banishment; so he died, a citizen of Tomi, in his 60th year. His works which have come down to us, either in whole or in part, appeared in the following order: 1. *Amorum Libri III.*, revised and abridged ed. of an early series. 2. Twenty-one *Epistolæ Heroidum.* 3. The *Ars Amatoria.* 4. *Remedia Amoris.* 5. *Nux*, remonstrance of a nut-tree against the ill treatment it receives from the wayfarer, and even from its owner. 6. *Metamorphoseon, Libri XV.:* this is deservedly O.'s best-known work. It seems to have been written between the poet's 40th and 50th years, and consists of all the transformations of gods, goddesses, and heroes recorded in legend from the creation to the time of Julius Cæsar, whose change into a star forms the last of the series. 7. *Fastorum Libri XII.*, the first six of which are all that remain: the poem is a Roman calendar versified, and describes the appropriate festivals and mythic legends, from materials supplied by the old annalists. 8. *Tristium Libri V.*, written in elegiac meter, during the first four years of the poet's banishment; mainly descriptive of his miserable fate, and full of appeals to the clemency of Augustus. 9. *Epistolarum ex Ponto Libri IV.*, also in elegiac meter, and similar in substance to the *Tristia.* 10. *Ibis*, a short satire against some traducer of the poet's. 11. *Consolatio ad Liviam Augustam*, held spurious by some critics. 12. *Medicamina Faciei* and *Halieuticon*, dubiously genuine, and of which only fragments remain. Several of his works are entirely lost, the one best known to antiquity being *Medea*, a tragedy.

The poetical genius of O. has always been admired. A masterly facility of composition, a fancy vigorous and rarely at fault, a fine eye for color, and a versification very musical in its flow, are the merits which have made him a favorite of poets from Milton downward, in spite of his occasional falsity of thought. He has most vivid inventiveness, most unflagging animation, exuberant fancy, picturesque beauty of description. Of the elegiac meter, he is the acknowledged master. But O., with all his fervor and vitality, is the poet of luxury. No note of grandeur, of intellectual sublimity, of moral elevation, is ever sounded by him; no line of an ideal humanity, no vision of majestic spiritual beauty, is ever reached or even remotely suggested by his art. The best editions of O.'s entire works are Burmann's (Amsterdam 1727), and the recent one of Merkel; while excellent commentaries on one or other of his poems have been published by Haupt, Ramsay, and Paley. A good translation of his *Metamorphoses* is that edited by Garth, with the assistance of Dryden, Addison, Congreve, and others; while special passages of the same poem have been admirably rendered by D'Arcy Thompson.

OVIDIAN, a. *ō-vĭd'ĭ-ăn:* resembling Ovid, the anc. Latin poet, or his poetry.

OVIDUCT, n. *ō'vĭ-dŭkt* [L. *ovum*, an egg; *ductus*, led, conducted]: the passage from the ovary to the uterus; the Fallopian tube.

OVIE'DO: province of Spain: see ASTURIAS.

OVIEDO, *o-ve-ā'thō:* pleasant and healthful city of Spain, cap. of the modern province of O. (anc. Asturias, q.v.); on a plain between the rivers Nalon and Nora, 61 m. n.n.w. of Leon, 22 m. s.s.w. of Gijon, on the Bay of Biscay. In the centre of the city is a handsome square, from which four principal streets, terminating in alamedas or promenades, branch off toward the n., s., e., and w., respectively. These main streets are connected by others, and all are clean and well paved. Pure water is abundantly supplied by a long aqueduct, and is delivered in the city by 11 public fountains. The cathedral, a beautiful cruciform specimen of Gothic, richly ornamented, contains (in the Chapel of the Virgin) the remains of many of the early kings and princes of Asturias, and has a fine old library. Some curious but eminently questionable relics are in the church of *San Miguel*, the second oldest Christian building after the Moorish invasion. In the immediate vicinity of the city are other churches in the early Saxon style, which are among the oldest in the peninsula. The convent of San Vincente, founded 1281, has been secularized, and is now occupied by govt. offices, etc. Linens, woolens, hats, and firearms are manufactured. Pop. 25,460.

O. was known during the middle ages as *Civitas Episcoporum*, because many of the Spanish prelates who had been dispossessed of their sees by the Moors took refuge here. This city, the see of a bishop, was twice plundered of its ecclesiastical and other treasures during the war of independence; first by Soult, afterward by Bonnet.

OVIEDO Y VALDES, *o-ve-ā′thō e vâl-dĕs′*, Gonzalo Fernandez de: Spanish chronicler: 1478–1557; b. Madrid. He was sent by Ferdinand to San Domingo, W. Indies, 1514, as intendant and inspector-gen. of the trade of the new world. During his long residence there, he spent his leisure in acquiring a knowledge of the W. Indies; and, after his return to Spain, published at Toledo, 1526, *Summario de la Historia General y Natural de las Indias Occidentales*, dedicated to Charles V. He afterward made additions to the work, which was republished at Seville 1535, 21 vols., under the title *La Historia General y Natural de las Indias Occidentales*. He left other 29 books in MS. A complete ed. was published at Madrid (1851–55). O. died at Valladolid. Besides his *History of the W. Indies*, he wrote *Las Quinquagenas*, a valuable, gossiping, and anecdotical account of all the principal personages of Spain in his time, still in MS. in the royal library at Madrid; and chronicles of Ferdinand, Isabella, and Charles V. A life of Cardinal Ximenes is also attributed to him.

OVIFEROUS, a. *ō-vĭf′ér-ŭs* [L. *ovum*, an egg; *fero*, I bear]: egg-carrying, applied to such animals as spiders, that carry about with them their eggs after exclusion; or Ovigerous, a. *ō-vĭj′ér-ŭs* [L. *gero*, I bear], with the same sense.

OVIFORM, a. *ō′vĭ-fawrm* [L. *ovum*, an egg; *forma*, shape]: egg-shaped.

OVILE, a. *ŏ′vīl*, or Ovine, a. *ō′vīn* [L. *ovis*, a sheep]: pertaining to or consisting of sheep.

OVIPAROUS, a. *ō-vĭp′ă-rŭs* [L. *ovum*, an egg; *parĭō*, I produce]: producing young by eggs hatched after exclusion from the body of the parent. Except the mammalia, all animals are either Oviparous or Ovoviviparous (q.v.); the latter mode—not essentially different from the former—being comparatively rare. Even those invertebrate animals which multiply by gemmation and division have also a true reproduction by *ova*. See Egg and Reproduction. Ovip′ara, n. plu. *-ă-ră*, animals which bring forth their young as eggs.

OVIPOSIT, v. *ō′vĭ-pŏz′ĭt* [L. *ovum*, an egg; *posĭtus*, placed]: to lay eggs. O′vipos′iting, imp. O′vipos′ited, pp. O′vipos′iting, n., or O′viposi′tion, n. *-pō-zĭsh′ŭn*, the laying or depositing of eggs. O′vipos′itor, n. *-pŏz′ĭ-tér*, the instrument or organ, terminating the abdomen, by which an insect deposits its eggs.

OVISAC, n. *ō′vĭ-săk* [L. *ovum*, an egg; *saccus*, a bag]: the egg-bag or membrane which connects in one mass the eggs, spawn, or roe of crustaceans and many insects; the cavity in the ovary containing the ovum.

OVOID, a. *ō′voyd*, or Ovoidal, a. *ō-voyd′ăl* [L. *ovum*, an egg; Gr. *eidos*, form or shape]: having a shape resembling an egg. O′void. n. a solid with an ovate figure.

OVOLO, n. *ŏ'vŏ-lō* [It. *ovolo*, a wave, an ogee—from L. *ovum*, an egg]: in *arch.*, a round or convex molding in the form of an egg. See MOLDINGS. In Roman architecture, the O. is an exact quarter of a circle; in Greek architecture, the curve is sharper at the top, and quirked. It is used sometimes in *Decorated* Gothic.

OVOLOGY, n. *ō-vŏl'ŏ-jĭ* [L. *ovum*, an egg; Gr. *logos*, discourse]: the branch of natural science which treats of the origin and functions of eggs; a description of the ovum.

OVOVIVIPAROUS, a. *ŏ'vō-vī-vĭp'ă-rŭs* [L. *ovum*, an egg; *vivus*, alive; *parĭō*, I produce]: term applied to animals of which the egg is hatched within the body of the mother, so that the young is excluded alive, though the fetus has been inclosed in an egg almost to the time of parturition: it is probable that the egg is often broken in parturition itself. Some fishes are ovoviviparous, and some reptiles; also the *Monotremata*. The common lizard and the viviparous lizard, both natives of Britain, are illustrations of the near resemblance which may subsist between Oviparous (q.v.) and ovoviviparous animals. The distinction is much less important than might be supposed.

OVULE, n. *ō'vūl*, or O'VULUM, n. *-vū-lŭm* [dim. of L. *ovum*, an egg: F. *ovule*]: in *bot.*, the germ borne by the placenta of a plant, which gradually changes into a seed; the seed contained in the ovary. The Germen (q.v.) or ovary sometimes contains only one O., sometimes a small *definite* number, sometimes a large *indefinite* number. Ovules are to be regarded as metamorphosed buds. 'The single ovule contained in the ovaries of compositæ and grasses may be called a terminal bud, surrounded by a whorl of adhering leaves or carpels, in the axil of one of which it is produced.'—Balfour, *Manual of Botany*. The O. is not always contained in an ovary. In Gymnogens (q.v.), the ovary is wanting, and the O. is *naked;* but the plants possessing this character are comparatively few. The O. is attached to the *Placenta* (q.v.), and by it to the Carpel (q.v.), from which it is developed. The attachment to the placenta is either immediate, when the O. is said to be *sessile;* or by an umbilical cord (*funiculus*), which sometimes elongates very much after fecundation. The O. is, in general, essentially formed of a cellular *nucleus* inclosed by two membranes, the outer of which is called the *primine*, and the inner the *secundine*. At one end of the nucleus there is an opening of both membranes—the *foramen*—through which the access of the pollen in Fecundation (q.v.) takes place. The *Chalaza* (q.v.) unites the nucleus and these membranes at the base. When the O. is so developed that the chalaza is at the base, and the foramen at the apex, it is said to be *orthotropal* [Gr. *orthos*, straight; *tropos*, a mode]. When the O. is bent, so that the foramen is brought near the base, it is called *campylotropal* [Gr. *kampylos*, curved]. When, by increasing on one side more rapidly than on the other, the O. has its foramen close to the base, the chalaza being carried round to the opposite extremity, the O. is *anatropal* [Gr. *anatrepo*, to turn upside-down]. Anatropal ovules are very common. When the O. is attached to the placenta so that the foramen and chalaza are at opposite ends, the base being in the middle, it is called *amphitropal* [Gr. *amphi*, around].—When the O. arises from the base of the germen, it is said to be *erect*; when it hangs from the apex of the cavity of the germen, it is *pendulous*; when it arises from the side of the germen above the base, it is *ascending*; when it hangs from the side of the germen below the apex, it is *suspended*. When two or more ovules are found, not only in the same ovary, but in the same cell, they usually have different modes of attachment. See CHALAZA: EMBRYO: FECUNDATION: GERMEN: PLACENTA: SEED.

OVULITES, n. plu. *ō'vū-līts* [L. *ovum*, an egg; Gr. *lithos*, a stone]: in *geol.*, a general name for all fossil eggs, whether of birds or reptiles.

OVUM, n. *ō'vŭm*, OVA, n. plu. *ō'vă* [L. *ovum;* F. *ove*, an egg: Gr. *ōŏn*, an egg]: an egg; in *arch.*, an egg-shaped ornament. OVULATION, n. *ō'vū-lā'shŭn*, the formation, development, and discharge of the eggs.

OWASCO, *ō-wâs'kō*, LAKE: beautiful sheet of water in Cayuga co., N. Y., 3 m. from Auburn; about 11 m. long, and 1 to 1½ m. wide; 758 ft. above sea-level. Through Owasco creek, the water flows through Auburn into the Seneca river. It is in the midst of charming scenery, is surrounded by a productive region, and is a popular summer resort.

OWE, v. *ō* [Goth. *aigan*, to possess; *aihts*, possessions; Icel. *eiga;* AS. *agan*, to possess: Ger. *eigen;* AS. *agen;* Scot. *awin*, what is possessed by any one, own]: to be indebted to; to be obliged or bound to pay. OWING, imp. *ō'ĭng*, due, as a debt; imputable to; ascribable, as to a cause; consequential. OWED, pp. *ōd*. See also OWN 1. *Note.*—'*To own a thing* is to claim it as possessed by one's self: *to owe money* is an elliptical expression for having it to pay to another, or possessing it for another. A Yorkshireman says, "Who *owes* this?" meaning, "Who is the possessor of this? To whom does this belong?" '—Wedgwood.

OWEGO, *ō-wē'gō:* village, cap. of Tioga co., N. Y.; on the New York Lake Erie and Western, the Delaware Lackawanna and Western, and the Lehigh Valley railroads, and at the confluence of the Owego creek with the Susquehanna river; 22 m. w. of Binghamton, 237 m. w. of New York, 37 m. e. of Elmira. It has 8 churches, an academy and excellent public schools, a public library, a fine court-house, 1 daily and 3 weekly newspapers, and three national banks (cap. $250,000). There are foundries, machine-shops, flour-mills, planing-mills, a piano factory, carriage-works, and various manufactures. The village is in a fine farming district, with which it has considerable trade; the streets are wide, and pleasantly shaded with maple-trees; and the place is growing in favor as a summer resort. The first white settlement was made 1785, and the village was incorporated 1827. Pop. (1870) 4,756; (1880) 5,525; (1890, estimated) 6,000.

OWEN, *ō'wĕn*, **John**, D.D.: eminent Puritan and Congregational divine: 1616–1683, Aug. 26; b. Stadham, Oxfordshire, England; son of the Rev. Henry O., vicar of Stadham; of an ancient Welsh family. In his 12th year he was entered of Queen's College, Oxford, where he worked with amazing diligence, for years taking no more than four hours' sleep a night. In 1635 he 'commenced' M.A. At this period (if his own statement does not exaggerate), his great ambition was to acquire celebrity either in church or state; and he confesses the irreligiousness and worldliness of his motives with entire frankness. Yet he appears to have been agitated even during his student life by the *quæstiones vexatæ* of ecclesiastical politics, and made himself so conspicuous by his anti-Laudianism that he was forced to leave Oxford. His parents were Puritans who had remained in the Chh. of England; and gradually his own Puritanism became so decided that most of his student friends abandoned his society. The next five or six years of his life were spent generally in a state of anxious and melancholy introspection. When the civil war finally broke out, O. was living as chaplain with Lord Lovelace of Hurley, in Berkshire. His lordship was a royalist, and went to join the king's army, whither O., who had warmly espoused the cause of the parliament, could not accompany him. About the same time, his uncle, a gentleman of property in Wales, who, having no children of his own, meant to have made O. his heir, indignant at the zealous Puritanism of his nephew, settled his estate upon another, and died without leaving him a farthing. The almost friendless scholar now removed to London, where a casual sermon, preached by a stranger in Calamy's church, had the effect of imparting to his soul the peace of Christian faith. In 1642 he published his *Display of Arminianism*, a work very acceptable to the Puritan party, and drawing to him the favorable regards of the house of commons. Soon afterward, the 'Committee for Purging the Church of Scandalous Ministers' presented him with the living of Fordham, in Essex. His ministrations were exceedingly popular, people coming from great distances to hear him preach. About 1646 he removed to Coggeshall, where his views of church government underwent a modification. Till this time, though he had favored a church polity consisting less in government and more in fellowship, he had been counted a Presbyterian; but he now became a moderate Independent, i.e., a Congregationalist. The Presb. clergy—intolerant and dogmatical—fell upon him at once for his 'apostasy,' but failed to perturb his sober temper. At Coggeshall he wrote his *Salus Electorum*, *Sanguis Jesu* ('The Blood of Jesus, the Salvation of the Elect'), the result of seven years' study, and of which he himself said that 'he did not believe that he should live to see a solid answer given to it.' His fame still increasing, he was sent for 1646 to preach before the parliament. To his discourse, entitled *A Vision of Free Mercy*, he added an appendix, in which he pleads for liberty of conscience in matters of religion, which was entirely in accord with Cromwell's principles, but not with the then prevalent Presb. view. In 1647 he preached to the army under Fairfax besieging Colchester, uttering earnest dissuasion from religious persecution. He was again chosen to preach before the house of commons the day after the execution of King Charles I. (1649, Jan. 31), but discreetly avoided a vindication of the act. About this time, Cromwell made his acquaintance, and thought so highly both of his preaching and of his character that he insisted on O. accompanying him to Ireland, where the latter remained about half a year. In 1650 he went with Cromwell to Scotland, and resided in Edinburgh several months; 1651, the house of commons appointed him dean of Christ-Church, Oxford; and 1652, when only in his 36th year, Cromwell, as chancellor, made O. vice-chancellor of the university. He discharged his duties with utmost impartiality. Though himself a Congregationalist, and owing his honors directly to the Independent party, O. never showed himself a partizan. Most of the vacant livings in his patronage were bestowed on Presbyterians; and Episcopalians were allowed to celebrate Divine worship in their own way, nor could the vice-chancellor ever be induced to offer them the slightest molestation. While at Oxford, the 'Atlas of Independency,' as Wood grandiloquently dubs O., wrote his *Diatriba de Divina Justitia*, his *Doctrine of the Saints' Perseverance*, his *Vindiciæ Evangelicæ*—against Biddle (q.v.) and the Socinians—and his *Mortification of Sin in Believers*. He was one of the well-known 'tryers' appointed to 'purge' the church of 'scandalous' (i.e., royalist) 'ministers,' and in this capacity signalized himself by his friendly offices on behalf of men of learning and merit, among whom may be mentioned the celebrated Dr. Edward Pocock, prof. of Arabic. O. was not a subservient adherent of Cromwell, but publicly objected to the proposal that he should be proclaimed king. In 1657 he was succeeded as vice-chancellor of the univ. by Dr. Conant. The year after Cromwell's death, the Presb. party again became strong, and O. was immediately ejected from his deanery of Christ-Church, whence he retired to Stadham, in Oxfordshire, where he had purchased an estate, and where he formed a congregation, to which he ministered until his removal to London, shortly after the Restoration. The writings belonging to this period of comparative retirement are: *Communion with God; On the Divine Original, Authority, Self-Evidencing Light, and Power of the Scriptures; Theologoumena*, or *De Natura, Ortu,* *Progressu, et Studio, Veræ Theologiæ;* and an uncritical and unscholarly diatribe against Walton's *Polyglott*. In 1662 he published *Animadversions to Fiat Lux*, treatise by a Franciscan friar in the interest of Rom. Catholicism. It was followed by works on *Indwelling Sin*, on the cxxxth Psalm, and on 'The Epistle to the Hebrews,' the last of which began to appear 1668, and is usually reckoned O.'s *magnum opus*. In 1669 he published *Truth and Innocence Vindicated*, a reply to Samuel (afterward Bp.) Parker's *Discourse on Ecclesiastical Policy;* and 1673 became pastor of a large congregation in Leadenhall street. His last publications of importance were: *Discourse Concerning the Holy Spirit* (1674); *Doctrine of Justification by Faith* (1677), a treatise still much admired by many; and *Christologia, or Glorious Mystery of the Person of Christ.*

O. in his later years was held in the highest esteem by many of the most influential personages in the land, such as the Earl of Orrery, the Earl of Anglesea, Lord Willoughby, Lord Berkeley, Sir John Trevor. When he was at Tunbridge for the use of the waters, even the Duke of York and Charles II. showed him particular attention, and had long conversations with him on the subject of Nonconformity. O. died at Ealing, and was buried in Bunhill Fields. His funeral was attended by no less than 60 noblemen.—O. was the most voluminous, but not the most powerful, writer among the Puritan divines. His writing tends largely to prolix and passionless disquisitions; his arguments are tedious; his style is ponderous; he lacks spiritual perception; and one can almost pardon the irreverent criticism of Robert Hall, who is said to have pronounced them a 'continent of mud.' Yet O. had great learning; and in that age of almost universal partizanship his Christian moderation and sincerity were worthy of highest praise. The best ed. of his works was pub. Edinburgh (1856, *et seq.*).

O'WEN, JOHN JASON, D.D., LL.D.: 1803, Aug. 13—1869, Apr. 18; b. Colebrook, Conn. He graduated from Middlebury College 1829, from Andover Theol. Seminary 1831, and became a Presb. minister 1832. Though he preached for some time, he was never settled as a pastor. He was at the head of Cornelius Institute, New York, 1836–48, prof. of Latin and Greek in the New York Free Acad. 1849–53; in the latter year he was made vice-pres. of the institution (known since 1866 as the College of the City of New York), and held the position till his death. He was widely known as a classical scholar, and his translations of the *Anabasis*, *Odyssey*, etc., were in wide use in schools. Among his publications were *Acts of the Apostles, in Greek, with a Lexicon* (1850), and a *Commentary on the Gospels* (3 vols. 1857, republished 1873). He died in New York.

OWEN, Sir RICHARD: one of the most distinguished of anatomists and paleontologists: b. Lancaster, England, 1804, July 20. From the grammar school of that town, he passed at the age of 20 to Edinburgh University, where his natural talents early developed themselves. He was an active student, and, with others of kindred spirit, formed the Hunterian Soc., of which he was chosen pres. 1825. In 1826 he removed to London, joining the medical school of St. Bartholomew's Hospital; and to the Medical Soc. of that institution he communicated his earliest published paper: 'An Account of the Dissection of the Parts Concerned in the Aneurism, for the Cure of Which Dr. Stevens Tied the Internal Iliac Artery,' which appeared in *Medico-Chirurgical Transactions* 1830. It was doubted whether so deep-seated an artery could have been reached; but he showed that the ligature had been applied to the internal iliac, and the aneurism had in this way been obliterated.

It had been his intention to enter the navy; but when he finished his education, he accepted an appointment as assistant to Mr. Clift, curator of the museum of the Royal College of Surgeons, and helped him in the preparation of his catalogues of 'Pathological Specimens' (1830), 'Monsters and Malformations' (1831), but chiefly of the 'Specimens of Natural History in Spirits' (1830). He had, about this time, the fortune to obtain a specimen of *Nautilus pompilius*, an animal almost unknown, and of great importance not only in itself, but chiefly because of its numerous fossil allies. The results of his careful dissection of this specimen were published in an elaborate memoir, which at once gave him high position among naturalists, for its advanced views on structure and affinities. The continued examination of Hunter's extensive collections in the College of Surgeons' museum was his great work, resulting in the enlargement and arrangement of the collections, and in the publication of his *Descriptive and Illustrated Catalogue of the Physiological Series of Comparative Anatomy*, issued in sections 1833–40; of his *Palæontological Catalogue*, of which the Mammals and Birds were pub. 1845, and the Reptiles and Fishes 1854; and of his *Catalogue of Recent Osteology* (1854), in which he describes 5,906 specimens. The collections, which in 1828 were contained in one small, badly lighted room, in 1856, when O.'s connection with them terminated, filled ten times the original space—three large galleries having been specially erected to contain them. O.'s position as curator of the Hunterian Museum, to which he succeeded on the death of Clift, awakened in him a special interest in its famous founder. In 1837 he published a new ed. of Hunter's *Animal Economy*, adding to it all the known published papers of its author; and giving in the preface, for the first time, a descriptive narrative of Hunter's real discoveries. He afterward edited two vols. of *Essays and Observations on Nat. History, Anatomy, etc., by John Hunter* (1861), which had been saved from Home's unprincipled and barbarous destruction of Hunter's manuscripts, by having been transcribed by Clift, who was the last articled apprentice of Hunter. In the preface to these vols., O. showed Hunter's advanced views in geology and paleontology.

The first appointment of O. as public lecturer was to the chair of comparative anatomy in St. Bartholomew's Hospital 1834. Two years afterward, he succeeded Sir Charles Bell as prof. of anatomy and physiology in the College of Surgeons, and was in the same year appointed by the college first 'Hunterian professor.' For 20 years he continued to illustrate the recent and fossil treasures of the museum, until, 1856, he was appointed supt. of the nat. hist. depts. of the British Museum. This post he resigned on account of age 1883.

We have not space to record even the principal of O.'s numerous published papers. His earliest communications to the Royal Soc. were papers on the generation of the ornithorhynchus and of the kangaroo. In numerous memoirs 1835–62, he expounded the structure and affinities of the higher quadrumana; and in these and other papers, he proposed the use of the brain-structure, as an important element in classification. It has been objected that the particular parts to which he referred, in characterizing his highest class, are found in the lower classes; but the objectors forget that he does not use the existence of the parts as his characters, but only their remarkable development. A similar objection may be urged against every possible system of classification, for no decided line can be drawn around any group, the whole animal world being united by a graduation of structure. His exposition of the recent and fossil birds of New Zealand is well known. He published first two elaborate papers on the anatomy of the Apteryx, and then at intervals seven or eight monographs on the gigantic struthious Birds which formerly existed in those distant islands. His descriptions and restorations of extinct animals are perhaps the most important of all his labors. He has published a monograph on the British Fossil Mammalia and Birds, and six parts of an elaborate systematic history of British Fossil Reptiles. In describing the fragmentary fossil relics brought home by Darwin from S. America, he established many remarkable forms from very scanty materials, and showed that there existed in America, during the tertiary period, a mammalian fauna, the individuals of which were, for the most part, of gigantic size, yet similar in type to existing animals of that continent. Subsequently, he clearly expounded the various genera of huge sloths from the same region, whose remains were previously confounded or misunderstood. A series of fossils from Australia revealed to him a remarkable group of gigantic marsupials, resembling in type the present tenants of that island-continent. He was the first to expound the structure and affinities of the singular long-tailed bird from Solenhofen. See his well-known *Palæontology* (1861). Among his more recent works in this field are: *The Fossil Reptilia of S. Africa* (1876); *On the Fossil Mammals of Australia and on the Extinct Marsupials of England* (1877); and *On the Extinct Wingless Birds of New Zealand* (1879).—His great work on the microscopic structure of the teeth, the *Odontography*, published 1840–45, contains descriptions and exquisite drawings of the minute structure of a very extensive series of the teeth of every class of animals, and forms an immense storehouse of information alike to the anatomist and to the geologist. He has published original papers on every branch of the animal kingdom, living and fossil; and it has been said justly of him that, 'from the sponge to man, he has thrown light over every subject he has touched.' Some idea of the magnitude of his labors may be formed from the fact that his published productions amount to more than 360 different papers and works, many being most voluminous and laborious.

O. married, 1835, the only daughter of Clift, his colleague at the College of Surgeons. In 1858 he resumed his position as Fullerian prof. of physiology in the Royal Institution of Britain, which, about twenty years before, he had filled for two sessions; and in the following year he was appointed Reade lecturer by the Univ. of Cambridge; but has now resigned these offices. He is a fellow and active member of most of the metropolitan scientific societies, one of the eight foreign associates of the Institute of France, and an honorary member of many foreign societies. From France he received the order of the Legion of Honor; from Prussia, the Ordre pour le Mérite; from Italy, the order of St. Maurice and St. Lazare. He was made a companion of the Bath 1873, and a K.C.B. 1883.

O'WEN, ROBERT: social theorist and schemer: 1771, May—1858, Nov. 17; b. Newton, Montgomeryshire, Wales. He does not appear to have had more than a merely commercial education to fit him for common business. The point from which his peculiar career may be said to have started was his marriage, 1799, to the daughter of David Dale, owner of the celebrated cotton-mills at New Lanark, on the Clyde. This establishment was very successful as a money speculation, and it is noticeable that Jeremy Bentham made a small fortune by investing in it. Dale was known to be a thorough man of business; but whether O., by his peculiar faculties for organization, contributed to the prosperity of the establishment in its early stages, is doubtful. It is certain that, as his larger schemes developed themselves, he was felt to be a dangerous partner in a good business, and he was gradually elbowed out of any share in the management, and he finally (1828) disposed of his interest in the property.

It should be remembered, however, of a man whose life will go down to posterity as one long absurdity, that in his connection with New Lanark Mills he did practical good on a scale not small. He was naturally active and interfering, and, being a humane man, it struck him that much degradation, vice, and suffering arose from the disorganized manner in which the progress of machinery and manufactures was huddling the manufacturing population together. He introduced into the New Lanark community education, sanitary reform, and various civilizing agencies, which philanthropists at the present day are but imperfectly accomplishing in the great manufacturing districts. A factory was, however, far too limited a sphere for his ambition. He wanted to organize the world; and that there might be no want of an excuse for his intervention, he set about proving that it was in all its institutions—the prevailing religion included—in as wretched a condition as any dirty, demoralized manufacturing village. Such was the scheme with which he came out on the astonished world 1816, in *New Views of Society, or Essays on the Formation of the Human Character;* and he continued, in books, pamphlets, lectures, and other available forms, to keep up the stream of agitation for reorganization of society, on the principle of socialism, till his death. His plans for relief of pauperism found at first much public favor: leading journals and many eminent men gave him countenance. But his defiant attack on all forms of received religion, at a great meeting in London, wrought an instant change. His socialism was identified with infidelity, and all his efforts thereafter were discredited in the popular mind. He had at least three grand opportunities of setting up limited communities on his own principles—one at New Harmony, Ind., United States (1825); a second at Orbiston, Lanarkshire, Scotland; the third at Harmony Hall, Hampshire, England (1844). They all were, of course, failures, as were several subsequent attempts in the same direction; and O. attributed their failure to their not being perfected on his principles. His life was a remarkable phenomenon, from the preternatural sanguineness of temperament which, in the face of failures, and a world ever growing more hostile, made him believe to the last that all his projects were on the eve of success. In the revolution of 1848, he went to Paris, with hopes on the highest stretch; but his voice was not loud enough to be heard in that vast turmoil. He appeared at the meeting of the Social Science Assoc. at Liverpool in the autumn of 1858, with all his schemes as fresh as ever. He died a few weeks afterward. A life of O. by A. J. Booth appeared 1869 (Trübner).

O'WEN, ROBERT DALE: 1800, Nov. 9—1877, June 17; b. Glasgow, Scotland; son of Robert O. (q.v.). He came to the United States 1825, and was associated with his father in the effort to found New Harmony. In 1828 he established in New York a weekly journal, the *Free Inquirer*, to promulgate his socialistic ideas. He returned to Indiana 1835, and was elected to the legislature;

served in congress 1843–47, and, among other notable acts, introduced the joint resolution relative to the occupation of Oregon, as also the bill for the organization of the Smithsonian Institution: he served later as one of the regents of the institution. In the constitutional convention of Indiana 1850, he was chairman of the committee on rights and privileges; 1851, being a member of the legislature, he carried a bill for enlarging the rights of widows and married women. 1853–58, he was first *chargé d'affaires*, then minister at Naples, and negotiated two important treaties. During the civil war, he was an ardent Unionist, serving the country zealously with voice and pen, and with personal service as member of various commissions. His published writings are: *Education at New Lanark; Moral Physiology; Popular Tracts; Personality of God and Authority of the Bible; Pocahontas: a Drama; Public Architecture; Construction of Plank-Roads; Footprints on the Boundary of Another World; Beyond the Breakers; Debatable Land between This World and the Next;* finally, *Threading My Way*, an autobiography.

O'WEN, WILLIAM: English painter: 1769–1825; b. Shropshire. He studied painting under Catton and under Sir Joshua Reynolds. From the date of exhibition of his first portrait, 1792, he took good rank among portrait-painters, and had among his sitters many men eminent in politics and literature. His fancy-sketches also have merit.

OWENIA, *ō-ĕ′nĭ-ȧ* [named from Richard *Owen*, naturalist]: genus of trees, of order *Meliaceæ*, tribe *Trichilieæ*. Of the five species, all Australian, some have hard wood, excellent for cabinet-making: one of these, *O. venosa*, is called tulip-wood.

OWENITE, *ō′ĕn-īt:* one who accepts the socialistic theories of Robert Owen (q.v.).

O'WEN MER'EDITH (pseudonym): see LYTTON (EDWARD ROBERT LYTTON BULWER-LYTTON), Earl.

OWENSBOROUGH, *ō′ĕnz-bŭr-ŭh:* city, cap. of Daviess co., Ky.; on the Owensborough and Nashville and the Louisville St. Louis and Texas railroads, and on the Ohio river, 160 m. below Louisville. There are 18 churches, of which 5 are Bapt., 4 Presb., 3 Meth., 3 Rom. Cath., 1 Christian, 1 German Evangelical, and 1 Zion's Kirche; a female college, and 4 public schools (2 white and 2 colored) with property valued at $175,000; 2 daily and 4 weekly newspapers; 2 national, 2 savings, and 4 state banks (cap. $1,500,000); and 4 hotels. Among fine public buildings are the U. S. govt. building, the female college, and a theatre seating 1,800 persons. The principal streets are macadamized, there are gas and electric lights, and water is supplied by the Holly system. There are 22 tobacco stemmeries and factories, 10 distilleries, and 18 other manufactories. The total capital employed in these establishments is $2,400,000. The surrounding agricultural region is productive, and the Owensborough Falls of Rough and Green River railroad (mineral and timber line) leads to rich mines of coal and a fine lumber section. O. was settled 1815, and obtained a city charter 1850. Assessed valuation (1890) $4,225,786. Pop. (1870) 3,437; (1880) 6,231; (1890, census, first report) 9,818.

O'WENS COL'LEGE, Manchester: founded 1851, under the will of John Owens, a Manchester merchant, who, vexed with the tests in the universities, left £96,654 for instruction of young men 'in such branches of science and learning as were then and might be thereafter usually taught in English universities.' It was successful from the beginning; and the college has now a staff of about 50 professors and lecturers—some among the foremost men in their respective subjects—in the two depts. of arts, science, and law, and of medicine. There are between 20 and 30 scholarships and prizes, and a valuable fellowship. The handsome new college buildings, erected since 1870, were estimated to cost £120,000. The Beyer bequest (1876) added £107,000; the Sir Benjamin Whitworth bequest (1888) more than £100,000. The total of gifts (funds and buildings) may be stated approximately at about £500,000 ($2,500,000): total students (1889) 846, including 405 art students, 61 women, 380 medical students. Principal registrar, H. W. Holder, M.A.—See Thomson's *Hist. of O. College.*

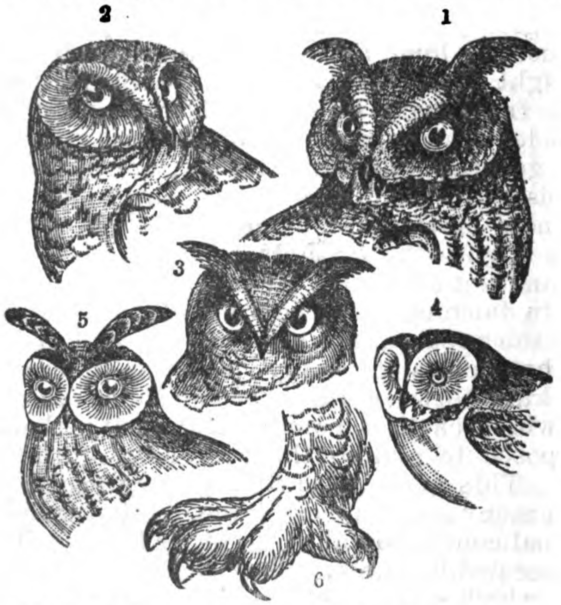
In 1880 a charter was granted to a new VICTORIA UNIVERSITY, of which O. C. was constituted a college. Other colleges (e.g., Yorkshire College at Leeds) may be admitted on certain conditions. The univ., which will be ultimately a federation of colleges, has its seat in Manchester; and, unlike London Univ., is at once a teaching and examining body, exacting from intending graduates attendance on a defined course of study. Every college admitted to the federation must have a sufficient teaching staff and curriculum, must be established on a sound basis, and must be under control of its own governing body. The univ. court has power to exclude any college that has ceased to be efficient.

O'WEN SOUND: town, cap. of Grey co., Ontario, Canada; on the Canadian Pacific railroad, and on Owen Sound and Georgian Bay; 45 m. from Collingwood, 122 m. n.w. of Toronto. It is a port of entry, has an excellent harbor, which admits the largest vessels, and has extensive lumber and grain trade. There are 1 monthly and 2 weekly papers, and 5 banks. There are excellent water-power and numerous manufactures, including agricultural implements, wooden ware, sewing-machines, and woolen goods of various kinds. There is also some ship-building. Pop. (1890) about 5,000.

OWL, n. *owl* [AS. *ule;* Icel. *ugla;* Ger. *eule;* Dut. *uil*, an owl: comp. L. *ul'ŭlă;* Skr. *ulúka*, an owl—from the cry of the bird]: well-known rapacious bird which flies during the night, and hoots or howls: the name is a general designation for every nocturnal bird of prey. OWLISH, a. *owl'ĭsh*, or OWL-LIKE, a. *-līk*, resembling an owl. OWLET, also spelled HOWLET, n. *owl'ĕt*, an owl; young owl.—The *Owl*, comprising nearly 200 recognized species, forms a numerous and well-defined group of birds, constituting the family *Strigidæ*. It is to be noted, however, that ornithologists differ greatly in their classification, and that the nomenclature is confused. The owls are easily distinguished by the large size of their heads, and by their great eyes, directed forward, and surrounded with more or less perfect disks of feathers radiating outward; while the small hooked bill is half-concealed by the feathers of these disks, and by bristly feathers which grow at its base. The bill is curved almost from its base; the upper mandible not notched, but much hooked at the tip. The claws are sharp and curved, but, like the bill, less powerful than in the *Falconidæ*. The outer toe is generally reversible at pleasure, so that the toes can be opposed two and two, to give greater security of grasp. The wings, though usually long, are less adapted for rapid and sustained flight than those of the diurnal birds of prey, and the bony framework by which they are supported, and the muscles which move them, are less powerful; the owls in general taking their prey, not by pursuit, but by surprise, to which there is a beautiful adaptation in the softness of their plumage, and their consequently noiseless flight—the feathers even of the wings being downy, and not offering a firm resisting surface to the air, as in falcons. The soft and loose plumage adds much to the apparent size of the body and of the head; but the head owes its really large size to large cavities in the skull, between its outer and inner *tables* or bony layers, which cavities communicate with the ear, and are supposed to add to the acuteness of the sense of hearing. This sense is certainly very acute, and the ear is, in many species, very large. It is furnished with an external conch, found in no other birds. It is, however, concealed by the feathers, being on the outside of the disk which surrounds the eye; but the feathers immediately surrounding the ear are arranged in a kind of cone, serving a purpose like that of an ear-trumpet. In some species, the ear is furnished with a remarkable lid or operculum, which the bird has the power of opening and shutting at pleasure. The disk which surrounds the eye serves to collect rays of light and throw them on the pupil; and owls can see well in twilight or moonlight, but are generally incapable of sustaining the glare of day, many of them becoming bewildered when exposed to it, and evidently suffering pain, which they instinctively seek to relieve by frequent motion of the third eyelid or nictitating membrane of the eye. The legs and feet of owls are feathered to the toes, and in many species even to the claws.

The digestive organs much resemble those of the Falconidæ, but there is no crop, and the stomach is more muscular. The gullet is very wide throughout, and owls swallow their prey either entire or in very large morsels. The largest species feed on hares, fawns, the largest gallinaceous birds, etc.; others on small mammalia, reptiles, birds, and sometimes fishes; some feed partly or chiefly on large insects.

Some of the owls have the disks of the face imperfect above the eyes, the whole aspect somewhat approaching that of falcons; the conches of the ears small, and the habits less nocturnal than the rest of this family. These constitute one of the three generally received divisions in which the species are arranged. Another division, with more perfect disks around the eyes, is characterized by the presence of two feathery tufts on the head, popularly called horns or ears, and sometimes egrets or aigrettes. The third division is destitute of these tufts, the disks of the face are perfect, and the ears are very large. On these distinctions, and on the feathered or unfeathered toes, and other points not of great importance, are founded the genera into which the Linnæan genus *Strix* has been broken by recent ornithologists. See, e.g., the characters of *Bubo* in the article EAGLE OWL.



1. Great or Eagle Owl (*Bubo maximus*) ; 2. Snowy Owl (*Nyctea nivea*) ; 3. Virginian Eared Owl (*Bubo Virginianus*) ; 4. White or Barn Owl (*Strix flammea*) ; 5. Long-eared Owl (*Otus vulgaris*) ; 6. Foot of Snowy Owl.

Owls are found in all parts of the world, and in all climates. Some species have very wide geographical range. The WHITE OWL, or BARN OWL, or SCREECH OWL (*Strix flammea*), is one of those having perfect disks around the eyes, and no aigrettes. It is about 14 inches in whole length. The tail is, as in most of the owls, rather short and rounded; the wings reach rather beyond the tail. The toes are not feathered. The head and upper parts are of pale orange color, marked by a multitude of small, scattered, chestnut-colored spots, and gray and brown zigzag lines; the face and throat white. This owl frequents old buildings and outhouses, destroys great numbers of rats and mice, and deserves the protection of the farmer. The voracity of owls is wonderful, and they kill, if possible, more than they need, storing for future use. The barn owl is easily tamed if taken young. When irritated, it has, like some other—perhaps all—owls, a habit of hissing and snapping its mandibles together. It seldom leaves its retreat by day, unless driven out; and when this is the case, all the little birds of the neighborhood congregate about it as an enemy which may then be safely annoyed, and the grimaces of the poor owl, blinded by the too strong light, are very grotesque. This species has been said to be an inhabitant of almost all parts of the world, but there is reason to think that similar species have been confounded.—The TAWNY OWL, BROWN OWL, or IVY OWL (*Strix*, or *Syrnium*, *stridula* or *aluco*), is a species about the size of the barn owl, or rather larger, with rather longer tail and comparatively short wings, the feet feathered to the claws; the upper parts mostly ash-gray mottled with brown, the under parts grayish white and mottled.—The LONG-EARED OWL (*Strix otus*, or *Otus vulgaris*) and the SHORT-EARED OWL (*S.* or *O. brachyotos*), species with aigrettes, are frequent British and American birds.—Of the species with imperfect disks around the eyes, and more falcon-like aspect, one of the most interesting is the SNOWY OWL (*Strix*, or *Surnia*, *nyctea*), the *Harfang* of the Swedes, a species seen, though rarely, in southern regions in winter, but well known in all far northern parts of the world. It is 22 to 27 inches in length, feeds on every kind of animal food which it can obtain, and has white plumage spotted and barred with brown, the legs densely feathered to the claws.—A very remarkable N. Amer. species is the BURROWING OWL (*Strix*, or *Athene*, *cunicularia*), which, when necessary, excavates a burrow for itself, but prefers to take possession of those of the marmot, called the Prairie Dog (q.v.), with which it is a joint tenant. It is not the only species of owl which inhabits holes in the ground.—The BOOBOOK, or BOOKBOOK, of Australia (*Strix*, or *Noctua*, *Boobook*) is a species of owl which frequently repeats during the night the cry represented by its name, as if it were a nocturnal cuckoo. Some of the species of owl are small birds; among the rarer species are one of 8½ inches, and one scarcely more than 7 inches long. Some owls are at least partially birds of passage; the short-eared owl is an example.

OWLGLASS (Ger. **EULENSPIEGEL**), **TYLL**: prototype of all the knavish 'fools' of later time; said to have been born in the village of Kneittingen, in Brunswick. His father was called Klaus Eulenspiegel, and his mother Anna Wortbeck. In youth, we are told, he wandered out into the world, and played all manner of tricks on the people whom he met with. His tomb is shown at Mölln, about four leagues from Lübeck, where tradition makes him die about 1350; but the inhabitants of Damme, in Belgium, also claim to have his bones in their churchyard, and place his death 1301—so that several critics regard Eulenspiegel as an altogether imaginary person, a mere *nominis umbra* affixed to a cycle of mediæval tricks and adventures. The opinion, however, considered most probable, is that Eulenspiegel is not a myth, but that there were two historical individuals of that name, father and son, of whom the former died at Damme, and the latter at Mölln. The stories that circulate in Germany under Eulenspiegel's name were not collected, as the book containing them itself informs us, till after Eulenspiegel's death, and without doubt were originally written in the Low German tongue; from Low German, they were translated into High German by the Franciscan Thom. Murner, and this translation was followed in all the old High German editions of the work. At a later period, it underwent considerable alterations, at the hands of both Protestants and Catholics, who made it a vehicle for the expression of their own likings and dislikings. The oldest known ed. is that printed at Strasburg 1519. The verdict of modern times has been unfavorable, not only to the æsthetic, but to the moral value of the book; yet though indecencies may be found abundantly in it, they may perhaps in large measure be attributed to the age in which Eulenspiegel or the author of Eulenspiegel lived. For centuries it has been a favorite people's book, not only in Germany, but in many other countries. Translations of it exist in Bohemian, Polish, Italian, English (as a *Miracle-Play*), Dutch, Danish, French, and Latin; it has been frequently imitated, and reprinted times without number till the most recent years. Max Müller, in *Lectures on the Science of Language*, points out that Eulenspiegel is the origin of the French word *espiègle*, waggish. When the stories about Eulenspiegel were translated into French, he was called Ulespiègle, 'which name, contracted afterward into *Espiègle*, became a general name for every wag.'

OWN, v. *ōn* [AS. *unnan*, to grant: Icel. *unna*, to grant, to allow: Ger. *gönnen*, to grant]: to grant; to admit; to avow; to confess. Owning, imp. *ōn'ĭng*. Owned, pp. *ōnd*, avowed; confessed. *Note.*—Own 2 in its origin is quite distinct from Own 1, but the words have become inextricably confused. The old sense was 'to grant as a favor,' hence 'to grant as an admission'—see Skeat.

OWN, a. *ōn* [from Owe: AS. *agen*, own: Icel. *eigin*, one's own; *eiga*, to possess: Goth. *aigin*, property]: belonging to, or that belongs to; peculiar; possessed; used after the poss. pronouns my, thy, his, her, our, your, their, to render them emphatic, as, our *own:* V. to hold or possess by right. Owning, imp. *ōn'ĭng*. Owned, pp. *ōnd*, possessed. Owner, n. *ōn'ėr*, the rightful proprietor. Own'ership, n. proprietorship; rightful or just claim or title. Ownership is not a legal term, though it is used frequently in law to denote the highest degree or kind of property which one can have in anything. Owner is often used in this sense as distinguished from an occupier, who has only a temporary interest in the property. Thus a freeholder, or one who holds a freehold estate in land, is an owner; though, in common parlance, it is not unusual to describe also as owner any one who has a long lease of the property. When a person is owner in fee of land, he has certain rights more or less absolute as incidental thereto—e.g., he may build on his land as high as he pleases, subject only to doing no direct injury to his neighbor, such as darkening his windows; and he may dig as deep as he pleases, or, as it is said, to the centre of the earth. There are certain things deemed incapable of ownership, such as the air, the sea, and the water of navigable rivers, as to each of which every individual member of the public has the right merely of using it, but no one has the ownership—i.e., the exclusive right of property as well as possession thereof. As to things wild, such as birds, beasts, fishes, the rule is that he who first catches the animal becomes the owner thereof, and acquires such a property in it that any one who takes it from him against his will commits larceny. But though the person who first catches a wild animal is entitled to it, penalties are sometimes imposed on the person catching it—as to which, see Game: Poaching. In regard to lost property—i.e., property once appropriated and possessed by some one who has casually lost or abandoned it—the rule is that he who finds it is entitled to keep it, provided at the time of finding it he had no means of ascertaining the owner. But the true owner, if he discover and can identify the property, can always, in general, reclaim it from the finder: see Lost Property.

OX, n. *ŏks*, Oxen, n. plu. *ŏks′n* [AS. *oxa;* Dan. *oxe;* Ger. *ochse;* Lap. *wuoksa;* Turk. *ogys*, an ox]: general name for animals of the bovine or cow kind; strictly, a gelded male of that kind at or near his full growth (see below). Oxlike, a. like an ox. Oxbird, a bird, a species of sandpiper. Oxbow, the yoke for an ox. Oxeye, the large wild daisy, known as *Chrysan′thĕmum leucan′thĕmum*, ord. *Composĭtæ* (see Chrysanthemum): a little bird called the great titmouse. Ox-eyed, having large eyes like the ox. Ox-gall, the bitter fluid secreted by the liver of the ox, used for scouring cloth, and by artists, after it has been refined, to give tenacity and fluidity to their colors. Oxgang [Scot. and prov. Eng. *gang*, to go]: as much land as an ox can plow during the proper season, reckoned from 15 to 20 acres. Ox-stall, a covered place for oxen. Oxlip, n. *ŏks′lĭp*, plant growing about hedges and borders of fields—so called from the fancied resemblance of the flowers to the lips of an ox; a kind of Primrose (q.v.), the *Primŭla elātĭŏr*, ord. *Primulācĕæ*.

OX (*Bos taurus*): ruminant quadruped of family *Bovidæ* (q.v.), the most useful to man of all domesticated animals. The species is distinguished by a flat forehead, longer than broad; and by smooth and round tapering horns, rising from the extremities of the frontal ridge. But among the many varieties or breeds, there are great diversities in the length and curvature of the horns, and some are hornless. It is probable that the ox is a native both of Asia and of Europe, perhaps also of Africa; and not improbable that it may have been domesticated at different times and in different countries. It cannot be confidently asserted that it now exists anywhere in a truly wild state; wild oxen are nowhere so abundant as on the pampas or great grassy plains of S. America, where it is certain that they are not indigenous; and it is not impossible that the wild oxen still existing in the parks of a few noblemen in Britain also may be descended from domesticated animals. On the question whether the Urus, described by ancient authors as an inhabitant of central Europe, was the original of the domestic ox, see Urus. The very early domestication of the ox is attested by the mention of it in the writings of Moses and of the ancient Hindus, by figures cut on Egyptian monuments 4,000 years ago, and by remains found in the Swiss lake dwellings of the stone age. In the early ages, the ox was a standard of value, and in semicivilized regions is still used in financial transactions. Abraham, Jacob, and other patriarchs had large herds of cattle; the Egyptians and Hindus venerated the bull, and it is frequently mentioned in the mythology of the Greeks and Romans. The ox was used for labor at a very early period; and though the milking qualities of the cow were only slightly developed as compared with modern times, the milk was a highly valued product. In civilized portions of Africa and Asia, in most European and S. American countries, and to some extent in the United

States and Canada, the ox is employed for farm labor. Varro, Bolumella, and other ancient Latin writers on agriculture, gave full directions for the care of oxen and the methods of training them for work. Though slow and liable to suffer from the heat of midsummer, the ox is strong and docile, is easily taught; and for working among stumps or rocks, in mud or in deep snow, is superior to the horse. In the lumber regions, and in the thinly settled portions of the e. part of the United States, many oxen are used, but in the vicinity of large towns and cities they have been largely superseded by horses. In the great farming regions of the central and w. parts of the country, oxen have never been extensively employed. The genus is valuable pre-eminently for flesh and milk; but the hide is made into leather, the horns into combs and other articles of use and ornament, the bones into fertilizers, the hoofs into glue, the hair is used in mortar, and the other portions of the animal are made to serve some useful purpose. Even where its labor is not required, it is invaluable to man, and in the early stages of civilization was one of the chief means of enabling him to subdue the earth and promote his material advancement. The period of gestation is about 285 days, but variations from 240 to 301 days sometimes occur, and the period is usually a little longer with a male calf than with a female. Twins, and even triplets, are sometimes produced; but there is seldom more than one calf at a birth. Some breeds mature earlier than others; but the period of growth ranges from 3 to 5 years, and of life from 18 to 25 years. Unless they are exceptionally hardy and valuable animals, cows for the dairy (see DAIRY) should not be kept after they are 10 or 12 years old, and many cannot be profitably kept as long; but some cows remain productive until they are 15 or 20 years of age. The ox is naturally gregarious, and in a wild state runs in large herds. On the vast plains of S. America, great numbers feed together, and when attacked by ferocious animals defend themselves vigorously. The cows and calves form the centre of a group, and the bulls face the foe, which they not infrequently destroy with their horns. It is supposed that these cattle descended from 7 cows and one bull which were taken from Spain to Paraguay about 1556. They are more easily domesticated than the semiwild cattle of Texas. The different breeds of cattle vary greatly in size, color, productiveness, and in adaptation to certain conditions of soil and climate. Some very small breeds occur in n. latitudes (e.g., the Shetland, found in small numbers in Great Britain) and in tropical regions. By some the small and humped cattle of the torrid zone are considered a different species from the common ox, though by others they are regarded as a variation from the ordinary type. The wild cattle kept in a few English parks are descended probably from the stock owned by the Britons at the time of the invasion by Cæsar. Those at Chillingham are particularly interesting; but it is probable that their uniformly white color is due largely to a long-continued process of selection, the keepers of the park having destroyed all party-colored calves. They are rather small and handsome creatures, with sharp and nearly straight horns. The Shetland breed, which originated probably in Scandinavia, is very small, the cow being little larger than a long-wooled sheep. The animals are very hardy, mature early, fatten readily, and make good beef; and the cows give a good quality of milk. Though useless where pastures are rich, they are well adapted to the barren region in which they are kept. A black breed known as the Kyloe or West Highland cattle, except in color resembling the Chillingham, is kept in small numbers in the Highlands of Scotland. It is very hardy, and the milk is rich, though too small in quantity to make the cows profitable for the dairy; but the beef is of superior quality. In Wales, the Pembroke and a few similar breeds are kept. They are hardy, mature slowly, and resemble the West Highland cattle, though the cows are somewhat better milkers. The Kerry breed, known as 'the poor man's cow,' is a native of Ireland, and has long been kept pure. It is extremely hardy, of moderate size, and matures rather slowly. The color is usually black, the cows are good milkers, and the beef is superior. The Shorthorn (sometimes called Durham) cattle, originating in Durham and York counties, England, are the most popular breed in that country, and a favorite in the United States. It dates from about the middle of the 18th c., and has been bred with great care since 1780. The Colling brothers, Bates, Booth, and other famous breeders, made a wonderful improvement in the character of this breed. Previous to 1810, when the first public sale of Shorthorns was held, cows and bulls had been sold by the Collings for £100 each; and at this sale the bull Comet, 6 years old, brought 1,000 guineas. The first importations of this breed to the United States were made about 1785, when a few animals were brought to what is now W. Va., and others to N. Y. About 1800 they were introduced into Ky. The Shorthorns are hardy, vigorous, mature reasonably early, are excellent for beef; and in families in which the tendency to fatten has not been pushed to an extreme, the cows are good milkers. The oxen are very large and strong, intelligent and docile, but rather slow in their movements. As a 'general purpose' breed, for milk, butter, cheese, beef, and labor, it is of great value, and it adapts itself readily to variations of soil and climate. It is extremely valuable also for breeding, and when crossed upon the so-called native stock produces an immediate and marked improvement. The grades often make good milkers, take on flesh readily, and make a good quality of beef. In the middle states, O., and the famous stock regions of Ky., Shorthorns are very numerous, but are not confined to these portions of the country. The color of the Shorthorn varies from roan to red or white. The breed has been brought to a high degree of perfection in the United States, and many fine animals have been purchased and shipped to England for breeding purposes. At a sale at New York Mills 1873, a Shorthorn cow was sold for $40,600, and a calf of the same breed, only five months old, brought $27,000. The Hereford breed has been developed principally from the cattle common in the county of Hereford, England, at the opening period of modern agriculture. Benjamin Tomkins made a wonderful improvement in this breed, commencing about 1766 and continuing till his death 1815, during which period the present characteristics of the breed were firmly fixed. The Hereford is large, red, with the distinguishing mark of a white face, hardy, matures rather early, is readily fattened, and makes beef of excellent quality. The cows are not specially valuable for milk, the efforts of breeders having been given almost exclusively to the development of the fattening quality. The Devon is claimed to be the oldest of the pure breeds. It had reached a high degree of excellence 1776, and several noted breeders have made improvements since that date. The color is a dark, solid red, and the horns are long, but smooth and graceful. The oxen are strong, active, tractable, and unsurpassed for work; the quality of the beef is excellent, and the cows are fair milkers. As a 'general purpose' breed, it compares favorably with the Shorthorns. It is quite desirable where the pastures are of only moderate fertility and the climate is rather severe. The Norfolk, known also as the Suffolk and Suffolk Dun, is an English breed, without horns, but in other respects resembling the Devons. The cows are good milkers, and the fattening qualities of the breed are excellent. The Sussex is a large red English breed, which thrives on rather short pastures, is moderately good for milk, but valuable for beef. The Longhorn breed, formerly popular in England, but now largely superseded, is large, coarse, with very long horns and only moderate milking

Bull (Shorthorn).

capacity. Blakewell, the famous breeder, is said to have begun his work of improvement with this breed. The Ayrshire, an excellent dairy breed which thrives over a wide range of territory and under greatly differing conditions, originated in Scotland, was brought to a high degree of excellence in the last half of the 18th c., and has since been bred with great care. It is of medium size, brown, brown and white, or red and white, not specially useful for beef, but of great value for the dairy. The cows are vigorous, and yield large quantities of milk which makes good butter and is superior for cheese production. It is a useful breed for crossing with native stock. The Aberdeen-Angus also is an old Scotch breed, but persistent efforts to improve it were not made until about 1800. The animals are black, hornless, and grow rapidly, the quality of the milk is excellent, and some families yield large quantity; but the breed is valuable specially for beef. In competition with a great number of other breeds, this won the first prize as a beef-producing breed at the world's fair, Paris, 1878, and won 61 of 63 prizes at the Kansas City and Chicago fat-stock shows 1887. The Galloway is a Scotch breed of great age and value. The animals are black, hornless, have thick skins, do not mature very early, but are quite hardy. The Holstein-Friesian (under which name breeders now include the Holstein, Friesian, and Dutch cattle) is a large black-and-white breed which originated and is still the favorite in n. Holland, and is said to be equal to the Shorthorn for feeding, and superior to the Ayrshire for milk. It is quite popular in the United States. The Dutch belted cattle are black and white, with the white, in the form of a belt around the body. They originated in Holland, are smaller but otherwise similar to the Holstein-Friesian, but require less luxuriant pastures. They are quite common in Orange co., N. Y., and there are numerous herds in other states. The Swiss cattle are of good size, brown color, hardy, vigorous, remarkably gentle, good feeders, and the cows yield a fair quantity of very rich milk. The Jersey, Alderney, and Guernsey cattle are from the Channel Islands, from which they receive their names. Of these the Jersey has been most widely distributed. It has been bred with extreme care for more than a century. It is pre-eminently a dairy breed. The animals are of only medium size, of fawn-color varying from light to dark and mixed with white, with fine heads, small horns, yellow skins, and a graceful form. A fair quantity of very rich milk is produced, from which the finest quality of butter is made. The cows are docile, but the bulls often prove treacherous and vicious. There are now more pure-bred Jerseys in the United States than in their original home. The Alderney resembles but is hardly equal to the Jersey. Very few Alderneys have been brought to this country. The Guernsey is larger and coarser than the Jersey, gives more milk, and is said to average more butter. The color is yellow, the cows are very gentle, and the bulls are more tractable than the Jerseys. There are comparatively few in the United States, but many have been taken to England. None of the Channel Islands cattle are desirable for beef. The Texan cattle, on the ranches in the w. United States, are descended from Spanish cattle which were brought to Mexico about 1525 by the early explorers of that region. They are coarse, are not readily tamed, and the cows give little milk; but they are quickly and wonderfully improved by crossing with the Shorthorn or some other established breed. What is known as native stock, which includes the mass of the cattle in the United States, is descended from early importations of cattle of different breeds from various portions of Europe. It contains many valuable animals and large numbers of cows useful for crossing with thorough-bred bulls. The bulls are not desirable for breeding. The first importation of cows into what is now the United States was made to Va. 1607. For some time the wilful destruction of a cow was punishable with death. Edward Winslow, afterward gov. of Plymouth colony, imported the first cattle into New England 1623. About 1625 the Dutch colonists of N. Y. imported a few cows from Holland; some time afterward there were importations from Denmark; and Swedish settlers in Del. brought over a few cattle 1627. Settlers in N. H., Penn., Md., and the Carolinas also brought cattle with them from their homes, or sent for them after reaching this country. Change of climate, scanty feeding, and want of protection from cold and storms, led to a marked deterioration in quality. Toward the close of the 18th c., small importations of improved breeds were made; but the first systematic and widely spread attempt to improve the character of live-stock in this country seems to have been about 1825. The Devons were then introduced into the east, and Shorthorns, Ayrshires, and Jerseys were imported. The financial panic 1837 checked importations, but the improved stock increased in numbers and was widely distributed. For about 10 years from 1850, large importations were made, and since the close of the civil war have been common. Of late, many fine animals for breeding and large numbers of beef cattle have been exported.

From a very early period, the cow has been cared for by man on account of her milk (see DAIRY), which is of itself an almost invaluable article of diet, and can be made into butter and cheese (see BUTTER: CHEESE)—important food products. Both cows and oxen are used for beef. It is easy to find a breed suited to any purpose and adapted to any locality. Upon the selection of a breed the success of the stock-keeper will largely depend, as adaptation to the conditions under which animals are to be kept is almost as important as inherent merit. Pure-bred cows are not absolutely required, but the use of thorough-bred bulls for breeding purposes is imperative.

OX.

The keeping of cattle is one of the most widely distributed and rapidly increasing of the agricultural interests in the civilized world; and in half-civilized regions oxen are used as beasts of burden, for draught, for riding, and are even trained for war. In the United States, great improvement in dairy stock and beef production has been and is still being made, but much remains to be done. The best calves should be raised and carefully fed (see DAIRY). Training for work should begin when the steers are quite young. They should always be kindly treated and petted, so that they can be easily handled. A small yoke may be put on their necks and the process of teaching may be considerably advanced before they are a year old. They may soon be made to draw a light cart, but should not be required to move heavy loads until they are 3 or 4 years old. The load, at first light, may be increased with the strength and experience of the animals. Care should be taken not to overload, and the oxen should be kindly treated. When at work, they should receive grain with their hay, and be supplied with pure water. In winter, or if worked on stony roads in summer, they will need shoeing. If well fed and kindly treated, the ox will do much work without losing flesh. Fattening of cattle may be done in pastures or in stalls. In the former case, the beef is known as 'grass-fed,' and in the latter as 'stall-fed.' To the profitable conducting of the former method, good Pastures (q.v.) are required; but a deficiency in this respect can be partially remedied by a system of soiling (see SOILING OF CATTLE). For fattening in the stall, hay and grain, ensilage, or roots, will be required in liberal quantities. A mixed diet is far better than any single article of food. In the United States, corn is the chief reliance for feeding; but cotton-seed meal, oil meal, and various other substances are largely used. The feeding should be regular, and be continued till the fattening process is completed. It is important that the animals have good care and protection from extremes of temperature. The breeds which mature early and fatten easily are to be selected for feeding. Young cattle can be fattened more readily and more profitably than old ones; but after oxen have passed their prime for work, and cows have become too old to be profitable as milkers, they may, by high feeding, be made into a fair quality of beef. When properly cared for, the ox is subject to but few diseases. Good food in suitable quantities and a reasonable degree of care and protection will nearly always keep the animals in thrifty condition.

During 1880–90 the cattle in the United States increased in number nearly 60 per cent., and at the close of the period reached about 57,000,000 head. Exportation to Europe varies with the prices in the domestic market, and is large only when rates here are unsatisfactory. In 1889 it reached 329,000 head, and the shipments during the first 9 months of the year make it certain that this number will be far exceeded in 1890.

OXALATE, n. *ŏks′ă-lāt* [L. *oxălis*, a kind of sorrel: Gr. *oxalis*, a sour wine, sorrel—from *oxus*, sharp, keen]: in *chem.*, a salt of oxalic acid. OXALIC, a. *ŏks-ăl′ĭk′*, pertaining to sorrel, or from it. OXALIC ACID, called also 'salt of sorrel,' a dry poisonous acid (see below). OXALIS, n. *ŏks′ă-lĭs*, genus of plants having an acid taste; the common wood-sorrel (see OXALIDEÆ). OX′ALITE, n. *-līt*, a native oxalate of iron, found in the brown-coal of Germany.

OXALIC ACID, *ŏks-ăl′ĭk ăs′ĭd* ($C_2H_2O_4$): important organic acid which exists ready formed in many plants as a potassium or calcium salt; it is produced by oxidation of a great variety of organic compounds. In the free state it occurs in *Boletus igniarius;* also, according to some observers, in the juice of the chick-pea; as a salt of potash it exists in the several species of *Oxalis* (whence *oxalic*) and of *Rumex;* as a salt of soda, in nearly all the species of *Salicornia* and *Salsola;* and as a salt of lime, in Rhubarb and many Lichens. It does not occur normally in the animal kingdom except in minute quantity and in combination with lime. Oxalate of lime is found in a crystalline shape both in healthy and in morbid urine. In the latter, it constitutes the leading symptom of the affection termed OXALURIA (q.v.), while in the former it occurs after the use of wines and beer containing much carbonic acid, of sorrel, rhubarb-stalks, etc., and after the administration of the alkaline bicarbonates. It is the constituent of the urinary calculus, known from its rough exterior as the mulberry calculus. Crystals of oxalate of lime have been found also in the mucus of the gall-bladder, on the mucous membrane of the impregnated uterus, and in morbid blood. They have likewise been detected in the biliary vessels and excrements of caterpillars. In the mineral kingdom, these crystals have been detected in association with crystals of calcareous spar.

In the production of O. A., the reaction in some cases consists in a definite substitution of oxygen for hydrogen: thus it is formed from ethene alcohol, $C_2H_6O_2$, by substitution of O_2 for H_4, and from ethyl alcohol, C_2H_6O, by the same substitution and further addition of one atom of oxygen. But in most cases the reaction is more complex, consisting of a complete breaking up of the molecule. In this manner, O. A. is produced in great abundance from the highly carbonized organic substances, sugar, starch, cellulose, etc., by the action of nitric acid, or by fusion with caustic alkalies. In the oxidation of sugar with nitric acid, $C_{12}H_{22}O_{11} + O = 6C_2H_2O_4 + 5H_2O$. One part of sugar is gently heated in a retort, with 5 parts of nitric acid of sp. gr. 1·42, diluted with twice its weight of water; copious red fumes are disengaged, and the oxidation proceeds with violence and rapidity. When the action slackens, heat may be again applied, and the liquid concentrated by distilling off the superfluous nitric acid, until it deposits crystals in cooling. These are drained, redissolved in a small quantity of hot water, and the solution is set aside to cool. O. A. separates in colorless, transparent crystals, derived from an oblique rhombic prism, and consisting of $C_2H_2O_4 \cdot 2H_2O$. The two molecules of crystallization water may be expelled by a very gentle heat, and then the crystals crumble to a soft white powder, anhydrous O. A., $C_2H_2O_4$. The substance has an intensely sour taste and a most powerful acid reaction, and is highly poisonous.

In consequence of its employment in cotton printing, bleaching straw, etc., O. A. is more accessible to the general public than many other poisons, and instances of suicide by swallowing it, and of accidental poisoning by its being sold by mistake for Epsom salts, are not very rare. In large doses it destroys life very rapidly: Dr. A. Taylor mentions a case in which a man died in 20 minutes after taking two ounces. Dr. Christison records a case in which an ounce killed a girl in 30 minutes, and another case in which the same quantity destroyed life in ten minutes; and, as a general rule (liable to exceptions), when the dose is half an ounce or upward, death follows within the hour. The symptoms are a hot or burning acid taste, with a sense of constriction or suffocation; vomiting, great pain in the region of the stomach, convulsions, cold perspirations, and general collapse speedily follow; and respiration shortly before death becomes slow and spasmodic. With the view of converting the free acid in the stomach into an insoluble and inert salt, chalk, whiting, or lime-water, with full draughts of milk, should be administered with the least possible delay. Salt of sorrel is almost as poisonous as the pure acid.

Like all other bibasic acids, O. A. forms, with monatomic metals, neutral or normal salts containing (M represents the metal) $C_2M_2O_4$, and acid salts, C_2HMO_4. With potassium and ammonium likewise it forms hyperacid salts, e.g., $C_2HKO_4 \cdot C_2H_2O_4$, or $C_4H_3KO_8$. With most diatomic metals, it forms only neutral salts, analogous to the hyperacid oxalates of the alkali metals. It also forms numerous well-crystallized double salts.

OXALIDEÆ, *ŏks-ăl-ĭd′ē-ē*, or OXALIDACEÆ, *ŏks-ăl-ĭ-dā′sē-ē:* natural order of exogenous plants, allied to *Geraniaceæ;* including herbaceous plants, shrubs, and trees; with generally compound alternate leaves; calyx of five equal persistent sepals; corolla of five equal unguiculate petals, spirally twisted in bud; ten stamens, usually more or less united by the filaments, in two rows; ovary usually 5-celled, with five styles; fruit a capsule opening by as many or twice as many valves as it has cells, or more rarely a berry; seeds few, attached to the axis. There are more than 300 known species, natives of warm and temperate climates. They are abundant in N. America and at the Cape of Good Hope. An acid juice is very characteristic of this order. Some of the tropical species produce agreeable acid fruits, as the Carambola (q.v.).—The genus *Oxalis* has a capsular fruit, and the seeds have an elastic integument, which at last bursts open and projects the seed to a distance. The species are mostly herbaceous plants, with ternate or digitate—rarely simple or pinnate—leaves; a few are shrubs. The stems and leaves generally contain a notable quantity of *Binoxalate of Potash*, and have therefore a sour taste.—The COMMON WOOD-SORREL (*O. acetosella*), very abundant in shady woods and groves in Britain and most parts of Europe and N. America, is a beautiful little plant, often covering the ground with its green leaves, amid which the white or slightly roseate flowers appear. Its leaves all grow from the root, a long leaf-stalk bearing three obovate leaflets; the scape bears a single flower. There is a subterranean scaly root-stock. On account of their grateful acid taste, the leaves are used in salads and sauces. The plant is very abundant in Lapland, and is much used by the Laplanders. It is antiscorbutic and refrigerant, and an infusion of it is a grateful drink in fevers. *Binoxalate of Potash* is obtained from the leaves by expressing the juice, and crystallizing; and is sold not only under the name *Salt of Sorrel*, but also of *Essential Salt of Lemons*, and is used for extracting spots, and particularly iron-marks, from linen, and for other purposes. Much of it is now, however, obtained from a very different source. See OXALIC ACID.—*O. corniculata*, a plant of very extensive distribution in Europe, N. America, India, Japan, and some of the African islands, has a branched stem, with decumbent branches, leaves very similar to those of the common wood-sorrel, and yellow flowers. Its properties agree with those of the common wood-sorrel. Many other species much resemble these in general appearance and properties. Some of the species exhibit an irritability like that of the Sensitive Plant, generally slight and only in hot sunshine; but *O. sensitiva*, an E. Indian species, with pinnate leaves, has this property in high degree. Some species of *Oxalis*, as *O. cernua*, native of s. Africa, are remarkable for producing large bulbels in the axils of the lower leaves. Several species have tuberous roots, and are cultivated for their tubers; as *O. crenata* and *O. tuberosa*, natives of Peru and Bolivia, where they are much esteemed, and both receive the name OCA. The tubers, when cooked, become mealy like potatoes. They have a slightly acid taste. *O. Deppei* is a Mexican species, with root somewhat like a small parsnip, quite free of acidity: it is much cultivated in its native country. *O. tetraphylla* and *O. crassicaulis*, natives of Mexico, and *O. enneaphylla*, native of the Falkland Islands, also have eatable roots. Many species of *Oxalis* are esteemed ornaments of gardens and greenhouses.

OXALURIA, *ŏks-a-lū′rĭ-a*, or THE OXAL′IC ACID DI-ATH′ESIS: morbid condition of the system, in which one of the most prominent symptoms is the persistent occurrence of crystals of oxalate of lime in the urine. These crystals occur usually as very minute transparent octohedra, but sometimes in the form of dumb-bells. To detect them, the urine, which usually in these cases presents a mucous cloud, should be allowed to stand several hours in a conical glass; and after the crystals have gradually subsided, the greater part of the fluid should be poured away, and the drops remaining at the bottom examined with a power of not less than 200 diameters. These crystals, insoluble in acetic acid, may occur either in acid or alkaline urine. Persons who secrete this form of urine are usually dyspeptic, hypochondriacal, and liable to attacks of boils, cutaneous eruptions, and neuralgia. The oxalic acid, in these cases, is not introduced into the system with the food, but is a product of the disintegration of the tissues, and is due to the conversion into $C_2H_2O_4$ of compounds that normally should have been converted into carbonic acid, CH_2O_3. The occurrence of oxalic acid as a persistent sediment in the urine is not only an indication of an existing morbid condition of the system, but may give rise to two perfectly distinct dangerous complications: (1) a concretion of oxalate of lime, $C_2CaO_4 + 4H_2O$ (mulberry calculus), may be formed either in the kidney or the bladder; and (2) bad consequences may arise from the poisonous action of the oxalic acid on the digestive organs, on the heart, and on the nervous system.

The treatment is simple. Care must be taken that the patient avoid articles of diet containing oxalic acid (such as sorrel, rhubarb, tomatoes, etc.), or readily converted into it (such as sugar), and all drinks containing much carbonic acid; while he should take plenty of exercise in the open air, without fatiguing himself; should use the shower-bath, unless he feels chilled and depressed after its application, in which case he should rub the body all over daily with a horse-hair glove; and should employ as a tonic medicine either a little nitro-muriatic acid in a bitter infusion (20 minims of the acid in an ounce and a half of Infusion of Chyretta), or five grains of citrate of iron and quinine three times daily. Under this treatment, the oxalates usually almost entirely disappear from the urine in two or three weeks.

OXAMIDE, n. *ŏks′ă-mīd* [L. *oxălis*, a kind of sorrel, and Eng. *ammonia*]: a white substance, the product of the destructive distillation of oxalate of ammonia. OXAM′IC ACID, *-ăm′ĭk*, a certain acid.

OXATYL, n. *ŏks′ă-tĭl* [Gr. *oxus*, sour, acid; *hulē*, material]: the radical of an important series of organic acids: see CARBOXYL.

OXENBRIDGE, *ŏks′ĕn-brĭj*, JOHN: 1609, Jan. 30—1674, Dec. 28; b. Daventry, Northamptonshire, England. He was educated at Oxford and Cambridge, graduating at Cambridge 1631. He took orders in the Church of England 1633, and soon went to Bermuda, where he assumed charge of a church. He returned to England about 1641, and in 1644 was ordained pastor of a church at Beverley, and chosen fellow of Eton Coll. He afterward took charge of a church at Berwick-on-Tweed, but was expelled from his living 1662 for nonconformity; he then went to Surinam, Guiana, as a missionary, remaining till 1667, when he removed to Barbadoes, and 1669 came to Massachusetts. He was ordained pastor of the First Church (Congl.), Boston, as colleague with the Rev. James Allen, 1670, Apr. 10. He was a popular preacher, and published several religious works.

OXENSTIERNA, *ŏks′ĕn-shĕr-nâ*, AXEL, Count of: Swedish statesman: 1583, June 16—1654, Aug. 28; b. Fanö, in Upland He was educated for the clerical profession, and studied theology and jurisprudence at Rostock, Jena, and Wittenberg, taking his degrees in Wittenberg. Although he afterward applied himself to public affairs, he continued all his life to take a deep personal interest in religious questions, and labored zealously for the Prot. cause. After leaving the univ., he visited most of the German courts, but returned to Sweden 1603, and soon entered the service of Charles IX., who, 1606, dispatched him as ambassador to the court of Mecklenburg. He became a senator 1608—a dignity which 13 of his predecessors in the countship had held in uninterrupted succession. Having shown great prudence and wisdom in affairs, he was appointed by Charles—now infirm from age—guardian of the royal family and head of the regency. On the accession of Gustavus Adolphus (q.v.), 1611, O. was made chancellor; and 1613 acted as minister-plenipotentiary in the negotiations for peace between Sweden and Denmark. In the following year he accompanied his sovereign to Poland, and by the peace of Stolbova, 1617, terminated hostilities between Sweden and Russia. His political sagacity was conspicuous in his successful efforts to prevent Gustavus from marrying Ebba Brahe, a Swedish beauty, and in bringing about a match between his master and Princess Maria-Eleonora of Brandenburg. In 1621, on the departure of the king for the Polish war, O was charged with administration of affairs at home; subsequently, he was appointed gov.gen. of the conquered districts; and 1629 concluded peace with the Poles, on highly favorable conditions. For a while, O. strongly opposed the desire of Gustavus to take part in the 'Thirty Years' War,' his hope being to see Gustavus arbiter of north Europe; but when he found that the Prot. sympathies of the king were irrepressible, he set about collecting money and troops for the perilous enterprise, with all the quiet but wonderful activity and persistency that remarkably characterized him. After

Gustavus had fairly entered on the bloody struggle, O. joined him, and conducted most of the extensive and complicated diplomacy which the course of events entailed on Sweden. The death of Gustavus seemed for a moment to stun O.; but he instantly recovered, and heroically resolved to continue the contest with the imperialists, in spite of the visible disaffection of many of the German Prot. princes, among others, of the elector of Saxony. The will of the dead monarch was sent to Stockholm; according to its conditions, the government—during the minority of Christina (q.v.)—was intrusted to five nobles, who empowered the chancellor to prosecute the war. His difficulties were enormous, yet by indefatigable efforts he managed partly to allay the discontents, jealousies, and rivalries of the Prot. leaders. The disastrous defeat of the Swedes at Nördlingen 1634, and the perplexities which followed, would have stupefied most men in the position of O., but only called out more energetically his splendid diplomatic genius. Transferring the leadership of the Prot. forces to Duke Bernhard (q.v.) of Weimar, he went, 1635, to France and Holland, and formed alliances with these countries. Returning to Germany, he assisted in quelling a mutiny among the Swedish troops at Magdeburg; put Pomerania in a state of defense, to resist the attack of the elector of Brandenburg; renewed the treaty with Poland; and leaving Baner in command of the Swedes, returned to Stockholm 1636. He continued to direct the policy of the Protestants in Germany, till the peace of Westphalia, 1648, put an end to the war. O.'s son was one of the Swedish envoys who signed the treaty, and it is in a letter to him that the famous sentence of the statesman occurs, *Nescis, mi fili, quantilla prudentia homines regantur* ('You do not yet know, my son, with how little wisdom men are governed'). Christina, who had been declared of age 1644, did not show proper respect for the advice of O.; and after she had—through mere feminine wilfulness—abdicated in spite of all his protestations, he withdrew from public life, and died shortly after she had left Sweden. He entertained a genuine affection for the daughter of his noble master, and in his last moments her name was upon his lips. Some treatises and historical fragments are attributed to him, and his 'Journal' has been published in the 'Stockholm Magazine.' See Lundblad's *Svensk Plutarch* (2 vols. Stock. 1824); Fryxell's *History of Gustavus Adolphus;* and Geijer's *History of Sweden.*

OXFORD, *ŏks′ford:* ancient and famous city and seat of learning in England, chief town of the county of Oxford; 55 m. w.n.w. of London; lat. 51° 45′ 55″ n., long. 1° 15′ 29″ w.; on the n.e. bank of the Thames (here locally called the Isis), a little above the point where it is joined by the Cherwell. Both streams are crossed by numerous bridges, of which the finest are Folly Bridge over the Isis and Magdalen Bridge over the Cherwell. Pop. (1871) 34,482; (1881) 40,837.

O. occupies an undulating site, is surrounded by rich and wooded meadows, and presents to the approaching visitor a scene of unequalled architectural magnificence—spires and towers and domes rising thickly. The four main streets of O. meet at right angles near the centre of the town, at a place still called Carfax, a corruption of *Quatre voies*, and which appears in Agas's map (*temp.* Elizabeth) as *Cater Voys.* These are—Cornmarket street, leading into St. Giles's, and running due n.; Queen street, leading to the railway stations, and running w.; St. Aldate's street, leading to the Isis, and running due s.; and High street, the chief street of the city, gracefully curving easterly, and conducting to the river Cherwell, which joins the Isis soon after it has passed Oxford.

The w. half of the town is the least interesting; and as the railway stations are here, travellers are introduced to the meanest parts of the city first. The county courts and jail, and the remains of the castle, from which Empress Maud escaped while it was besieged by King Stephen, will be observed in passing. There is one good street in this part—Beaumont street, on the site of the ancient Beaumont palace, in which Richard I. was born. At the end of this street is Worcester College. Passing n. from Carfax, along the Cornmarket, the old tower of St. Michael's Church is seen, against which stood formerly the n. gate of the city; next St. Mary Magdalen Church; then the Martyrs' Memorial, with the Taylor Buildings and Randolph Hotel on the left, and part of Balliol College and St. John's College on the right. St. Giles's Church is at the n. end of this street, which is very wide and has a row of elm-trees on each side, forming a picturesque avenue, like a foreign *boulevard.* Beyond this, to the n., are the Radcliffe Observatory and Infirmary. The High street is about 1,000 yards in length; it is reckoned one of the noblest streets—architecturally considered—in Europe, and contains, among other edifices, Magdalen College, the new Examination Schools, Queen's College, All-Souls' College, University College, and St. Mary's and All-Saints' Churches. Parallel to it is Broad street, in which are Balliol, Trinity, and Exeter colleges, the Ashmolean Museum, the Clarendon Buildings, the Sheldonian Theatre; and close by are the Bodleian Library, the Radcliffe Library, and Brasenose College. In St. Aldate's street, which forms the s. part of the series of streets above mentioned as forming one n. and s. line, is Christ-Church

College (the entrance tower of which contains the great bell 'Tom of Oxford,' weighing more than 17,000 lbs.) and St. Aldate's Church. The other colleges and important buildings connected with the Univ. of O. lie back from the principal streets. Though there is nothing extraordinarily fine about the architecture of the colleges regarded individually, yet the vast number of the structures and the variety of styles present a *tout ensemble* altogether sublime. The effect is wonderfully heightened by the interspersion of gardens, meadows, and venerable trees—old as the buildings that tower above them. Christ-Church is celebrated for its magnificent hall, picture gallery, and library, as well as for its extensive grounds; its chapel, the cathedral church of O., is Norman in style, but is inferior, in both size and beauty, to most English cathedrals. Merton College is a little s. of the High street, and still retains the original chapel and part of the other buildings erected by Walter de Merton in the 13th c. Magdalen College retains its celebrated cloister and tower of the 15th c., and its buildings are the most complete of any college in Oxford. Oriel College, a comparatively modern structure, is very picturesque, but far from chaste in design; New College ranks among the noblest buildings in the city—'the chapel, the hall, the cloisters, the groined gateways, and even some original doors and windows remain, in their exterior at least, as they came from the hand of their master-architect,' William of Wykeham, 500 years ago; Queen's College is in Grecian architecture, with a spacious and handsome chapel and a fine library; so is Trinity College; University College is a pleasing mixture of Gothic and Italian; Exeter College has a splendid frontage on the w., and its chapel (built 1857-8), in Gothic style, is the finest modern building in the city; it has also an excellent hall and a beautiful library; Balliol College has a remarkably fine chapel, built a few years ago. Among churches in O., besides the cathedral church and the college chapels, are—St. Mary's, attended by the members of the university; St. Martin's, the church of the corporation of O.; St. Peter's-in-the-East, with a Norman crypt; St. Michael's, with a Saxon tower; and St. Aldate's. The chief buildings connected with the univ., besides the Bodleian and the Ashmolean Museum above mentioned, are the Radcliffe Library, a circular structure, adorned with Corinthian columns and surmounted by a dome; the Radcliffe Observatory, crowned by an octagonal tower; the University Printing-office, the Taylor Institution, the Union Debating-rooms, and the New Museum. The Botanic Gardens are nearly opposite Magdalen College. Other notable buildings are—the Town Hall, the Radcliffe Infirmary, the County Gaol, and a Wesleyan and a Congl. chapel. Lady Margaret Hall and Somerville Hall, founded 1879 for women availing themselves of the lectures of the Oxford assoc. for promoting the higher education of women, are not officially connected with the university, though conducted in a practical correspondence with it.

O. is a mart for the agricultural produce of the neighboring country, but has little trade of its own, and is dependent for its prosperity chiefly on the university. It is a municipal and parliamentary borough, and governed by a mayor, nine aldermen, and thirty councilors, whose jurisdiction, however, does not embrace the university. The university sends two members to parliament; the city now sends only one.

O., by the Saxons called Oxnaford, and, in *Domesday Book*, Oxeneford (probably 'a ford for oxen'), is a place of great antiquity. The date of its origin is unknown, but as early as the 8th c. there was a nunnery here; and in 802 an act of confirmation by Pope Martin II. describes O. as an ancient seat of learning. It is said to have been a residence of King Alfred; also of Canute, who held several parliaments within its walls. The townsmen closed their gates against William the Conqueror, who stormed the town 1067, and gave it to one of his followers, Robert d'Oyley, who built a castle here to overawe the disaffected Saxons: some ruins of the castle are still seen. The paction that terminated the strife between Stephen and Henry II. was drawn up at Oxford. In the reign of Edward III., the preaching of Wickliffe excited great commotion among the students, and threatened almost the dissolution of the university. In the reign of 'Bloody Mary,' O. witnessed the martyrdoms of Ridley, Latimer, and Cranmer; and during the great civil war of the 17th c., it was for a while the headquarters of the royalist forces, and was conspicuous for adherence to Charles I. See OXFORD UNIVERSITY.

OX'FORD BLUES: see HORSE-GUARDS, ROYAL.

OX'FORD CLAY: principal member of the Middle Oolite series; a bed of stiff dark-blue or blackish clay, sometimes reaching a thickness of 600 ft. In its lower portion in some places are layers of tough calcareous sandstone, called Kelloway Rock, from a place in Wiltshire, England, where it is quarried. The O. C. lies beneath the plain on which Oxford is built, and extends s.w. and n.e. from the shore at Weymouth to the fenlands s. of the Wash; thence it may be traced through Lincoln into Yorkshire, until it disappears under the sea at Scarborough. The close packing of the fossils in the fine compact clay has caused them to be beautifully preserved; the shells frequently retain their iridescence, and even the softer parts of the cephalopods have sometimes left with tolerably clear definition their form in the clay. The fossils are, however, often filled with iron pyrites, which, on exposure to the atmosphere, readily decomposes and destroys all traces of the beautiful organism. The remains of chambered shells of the genera belemnites and ammonites are very abundant, with other shells, interesting crustacea, and the species of fishes and reptiles characteristic of the oolite.

OXFORDSHIRE, *ŏks′fȯrd-shėr:* inland county of England, bounded s. by the river Thames, e. by Bucks, w. by Gloucester; greatest length 52 m., breadth varying from 7 to 27½ m.; about 756 sq. m. =483,621 acres. The surface, where not level, is undulating. In the n.w. the hills rise in Broom Hill 836 ft. above sea-level, and in the s.e. of the county are the Chiltern Hills (q.v.), rising near Nutfield to 820 ft. in height. O. is watered along its s. border by the Thames, and the other chief rivers are the Windrush, Evenlode, Cherwell, and Thame, affluents of the Thames. By means of the Oxford canal, which joins the Thames at Oxford, the towns and districts lower down the river (Abingdon, Wallingford, etc.), are supplied with coal from the Leicestershire coal-fields. The climate is healthful, but generally colder than in other parts of s. England. The soil is fertile; agriculture is advanced, 417,606 acres being under crops, fallow, or grass 1881; and the county is one of the most productive in the country. Pop. (1871) 177,975; (1881) 179,559.

OX′FORD TRACTS: see TRACTARIANISM.

OX′FORD UNIVERS′ITY: ancient institution of learning in England, said to have been founded by King Alfred (d. 901). Without claiming for it an origin quite so ancient, we know that it is one of the three oldest universities in Europe—Paris and Bologna being the other two; and that, from very early times, students resorted to Oxford to attend lectures there delivered by learned men, and that they lived in the houses of the townspeople. In some cases they combined together to secure the service of a common teacher, with whom they lived in a large tenement called an inn, hostel, or hall. For a long time, however, the great majority of the students lodged in rooms hired from the citizens; and as late as 1512, regulations were made for the governance of such students. As their numbers increased, the halls were multiplied. Anthony Wood states that he could show the names and places of more than a hundred. The univ. seems to have grown up in the 12th c. A great diminution in the numbers of the students took place about the middle of the 15th c. This, among other causes, led to the gradual disappearance of the halls, which were bought up by the wealthier colleges. Only five of the halls remain, which differ from the colleges only in being unincorporated, and having little or no endowments. Residence in private lodgings had also fallen into disuse; and by the time of Queen Elizabeth, it had become a compulsory rule that all undergraduates should reside in some college or hall, at least for the first 12 terms of residence. Now, however, undergraduates may in most colleges live in lodgings from the beginning of their course.

The colleges were founded at various periods, from the end of the 13th c.: two-thirds of the number were founded before the Reformation. Their object originally was to support limited societies of students, who were to devote their lives to study—not, as at present, to educate large classes of the community. Students other than those on the foundation seem not to have been regarded by the founders as an essential part of the college. The colleges arose partly instead of the old halls, and partly at first as connected with the monasteries, by means of which institutions benevolent persons were enabled to give permanent support to poor secular scholars. University and Balliol, which now rank as the oldest colleges, were in fact halls supported by endowments held in trust for the maintenance of their students. The originator of the collegiate system, in anything like its present form, was Walter de Merton, who, besides having founded Merton College, is entitled to the honor of having mainly contributed to fix the university in its present site. All those on the foundation of the colleges before the Reformation were called Clerici. The great majority of the fellows were required to take priest's orders within a certain period after their election. This requirement of course involved celibacy, which, besides, was expressly imposed in some colleges; and practically, in old times as now, was enforced by the rule of life and the obligation of residence. Within the last few years, in some of the colleges the restriction of celibacy has been, under certain conditions, remitted in the case of fellows engaged in college work.

Under a statute passed 1868, any person may now become a member of the university without becoming a member of a college or hall, if he satisfies certain disciplinary requirements. For such purposes, these unattached students, known as 'non-collegiate,' are under the control of a board of delegates; but no special provision is made for their instruction. In 1871 the new foundation of Keble College, in memory of John Keble, was admitted to the same privileges (except as regards the academical status of its head) as are possessed by the existing colleges and halls.

The govt. of O. U. is vested in three bodies: (1) Hebdomadal Council, meeting weekly, consisting of the chancellor, the vice-chancellor, the two proctors, six heads of houses, six professors, and six members of convocation of not less than five years' standing—these heads, professors, and members of convocation being elected by congregation, and holding office six years. (2) Congregation, consisting of all the great officers of the univ., the professors, the public examiners, and all resident masters; which body now has the power of accepting or rejecting, and of amending, any statute framed by the hebdomadal council. (3) Convocation, consisting of all Masters of Arts, a body whose consent is necessary before any of the measures proposed by the hebdomadal board become law, which elects the chancellor, the two representatives of the univ. in parliament, and several of the professors, and which dispenses the ecclesiastical patronage of the university. The students not on the foundation are mostly commoners. In Worcester College and the halls there is still a class of fellow-commoners, who pay larger fees and have certain privileges. They consist mainly of men above the ordinary age of undergraduates, who wish to have the intellectual advantages of the univ. without being subjected to the common routine of discipline. All other formal distinctions due to wealth or poverty are almost entirely abolished—such as the special privileges of peers, and the regard had to the poverty of candidates in the case of certain scholarships. It is said to be very difficult to ascertain the actual number of students at any one time in Oxford; but, with the list of the colleges, with their respective heads, given at the end of this article, is a recent report of the number of undergraduates in each college.

There are four terms in each year—Michaelmas Term, Oct. 10—Dec. 17; Hilary Term, Jan. 14 to the day before Palm Sunday; Easter Term, Wednesday in Easter week to Friday before Whitsunday; Trinity Term, Saturday before Whitsunday to Saturday after the Tuesday first in July. Full Term, as it is called, does not begin till the first day of the week after the first congregation is held. By undergraduates, Michaelmas and Hilary terms are kept by six weeks' residence, and Easter and Trinity terms by three weeks each; but more than this is required by most of the colleges. 24 weeks may be taken as the ordinary *length of the academic year.* 12 terms of residence are required for the degree of B.A. from all. The degree of M.A. is obtainable in the 27th term, after matriculation. The following examinations have been necessary for a degree in arts since 1850; though new statutes which came into effect 1873–4 have considerably modified their nature: 1. Responsions, called 'Little Go' or 'Smalls' in the familiar language of undergraduates, are obligatory on all: most colleges require their members to pass responsions within their first year of study. 2. The First Public Examination, or Moderations, is obligatory on all: candidates must have entered on their fourth term: honors are awarded both in classics and in pure mathematics. 3. The Second Public Examination held twice a year, to be *passed* not earlier than the 12th term, and for honors not later than the 16th term of standing; unless the candidate has been classed in some other school of the Second Public Examination, in which case he may be admitted up to the 20th term inclusive. This examination consists of three parts: (1) an examination in the rudiments of faith and religion, or, in the case of those who (or whose guardians) object to such examination, certain substituted books or subjects: this examination is required of all candidates for the degree B.A.; (2) an examination of those who do not seek honors; and (3) an examination for those who do seek honors. In this last there are, in Oxford phraseology, six schools: Literæ Humaniores, Mathematics, Natural Science, Jurisprudence, Modern History, Theology. Candidates are entitled to a degree of B.A. who, having passed the two previous examinations, passed also the examination appointed for those who do not seek honors, or who obtain honors in any one of the six honor-schools. Candidates for honors may select any one, or more than one, of the six schools. The most popular of these is the school of Literæ Humaniores, in which the examination includes: (1) Greek and Latin languages; (2) histories of ancient Greece and Rome; (3) logic, and outlines of moral and political philosophy. Next in numbers of candidates is the school of Modern History. The organization of these six schools is at present the main function of the university as distinct from the colleges. Professorial teaching on its own account exists only to a very limited extent: in the main, the teaching power of the colleges is applied to preparing their undergraduate members for these various examinations.

Examinations take place also for degrees in law, medicine, divinity, and music; but these are in great measure formal. The examinations for degrees in arts are the proper work of the university.

Besides these honors, various distinctions are conferred by the university. There are several univ. scholarships, particularly the Vinerian law fellowships and scholarships; the Eldon law scholarship; one Sanskrit and two Hebrew scholarships yearly; two mathematical scholarships; the Hertford scholarship, for encouragement of the study of Latin; and the Ireland and Craven scholarships, for encouragement of the study of classics. There is also the Newdigate prize for the best composition in English verse, and the three chancellor's prizes for the best compositions in Latin verse, Latin prose, and English prose; the Gaisford prizes for Greek composition; and the Arnold, Stanhope, and Marquis of Lothian's prizes for the best essays on a historical subject. But the great prizes are the scholarships and the fellowships. These are now for the most part thrown open, and are awarded after examination without restrictions as to kin or place of birth; though at All-Souls', and also at St. John's College, an attempt has been made to keep up the former exclusiveness. The scholarships, so numerous as to be within the reach of any young man of ability, range from £60 to £80 a year, with rooms free, providing for a large part of the expense of a univ. education. At the close of this education come the fellowships; and it has been calculated that, when the arrangements of the commissioners who are introducing reforms are complete, there will be between 20 and 30 fellowships, mostly about £300 per annum, open yearly to competition.

Oxford is fed chiefly from the great English schools. A close connection subsists, by the terms of the foundation, between Winchester and New College, between Westminster and Christ-Church, and between Merchant Taylor's and St. John's: see the titles of these colleges.

OXFORD UNIVERSITY.

A student desirous of going to Oxford must apply to the head of the college to which he wishes to belong. Application in former times had to be made early, as all the good colleges were filled several years in advance. But now that undergraduates are allowed by most colleges to live in lodgings from the first, a candidate can have no difficulty in securing admission even to a distinguished college at short notice. There is no *university* examination at matriculation; but all the good colleges have such an examination before they receive any one—the standard of the examination, of course, varying with the college. After being received into the college, the undergraduate is sometimes assigned to a college tutor, who exercises a special control over his reading; but he also attends the instruction of the other college tutors or lecturers, as the course of his studies may require. The cost of tuition varies at different colleges, but an average of £65 may be given as paid by the undergraduate during his whole career: this payment is at some colleges distributed over three, at others over four, years. Besides this, almost every undergraduate finds it necessary, at some period before taking his degree, to read with a private tutor, whom he chooses for himself. Private tuition has grown to be quite an institution in Oxford, though not formally recognized. Many of the ablest young men, after taking their degree, remain in Oxford for a year or two, taking private pupils. In this way an undergraduate, even of a badly taught college, could secure the advantages of the best tuition. But during the last few years, the lecturers in different colleges have more and more combined and systematized their work; and thus to some extent obviated the need for private tuition. Much discussion has taken place on the merits and faults of this system; but, on the whole, it must be allowed to be useful for the tutor, as clearing up and concentrating his knowledge, while, at least to undergraduates who read for honors (with a few rare exceptions), it may be considered as absolutely necessary. Private tutors usually charge £10 a term for three hours a week. Previous to 1852, the professoriate of Oxford was strictly ornamental. A great effort was then made to stir it into life, which has been partially successful. New professorships were created, and the endowments of old ones were increased by the commissioners, under 17 and 18 Vict. c. 81. But the former of these measures, at least, whatever it may have done for the interests of science, has produced little effect on the undergraduates. They still limit their range of studies by the requirements of the examinations of the schools, and they can scarcely be expected to do otherwise. But professorial teaching has undoubtedly become more popular in the ordinary branches of study. Lectures by the professors of law and modern history, of moral philosophy, logic, Greek, and Latin, are felt to be useful, and are therefore well attended. Considerable changes in the univ. system have

been introduced since 1881, in accordance with the reforms suggested by the univ. commissioners—e.g., that professors should do more of the teaching, and that fellowships should be more numerous, of less value, and of shorter tenure than at present. The expenses vary at different colleges, not only indirectly from the tone of the society, but even directly from the charges made for necessaries. A man should be exceedingly comfortable at Oxford with £200 a year; on £150, he can manage with economy. There have been instances of men passing creditably through the univ. course on £100 a year; the *necessary* expenses do not exceed that sum. It appears that some unattached students cover their board, lodging, and tuition for about £45 a year. Discipline inside the college is maintained by the head of the house and the tutors; in the town and its neighborhood, by the proctors, who are univ. officers invested with great authority, which, as a rule, is well exercised. According to the *Universities Commission Report* (1874), the revenue of the colleges and univ. 1871 was £413,000. Chancellor (1889), the Marquis of Salisbury; vice-chancellor, J. Bellamy, D.D. (of St. John's).

The following is a list of the colleges and halls (1889): see these titles also in their alphabetical places—Colleges, etc.: (founded 1249) *University*—head, J. F. Bright, D.D.—undergraduates, 110; (1262) *Balliol*, Benjamin Jowett, M.A., 261; (1270) *Merton*, Hon. G. C. Brodrick, D.C.L., 119; (1314) *Exeter*, W. W. Jackson, M.A., 141; (1326) *Oriel*, D. B. Monro, M.A., 99; (1340) *Queen's*, J. R. Magrath, D.D., 134; (1386) *New*, J. E. Sewell, D.D., 219; (1427) *Lincoln*, W. W. Merry, D.D., 55; (1437) *All-Souls'*, Sir W. R. Anson, D.C.L., 4; (1456) *Magdalen*, T. H. Warren, M.A., 163; (1509) *Brasenose*, C. B. Heberdeen, M.A., 111; (1516) *Corpus*, T. Fowler, D.D., 84; (1532) *Christ-Church*, H. G. Liddell, D.D., 264; (1554) *Trinity*, H. G. Woods, M.A., 145; (1555) *St. John's*, J. Bellamy, D.D., 122; (1571) *Jesus*, H. D. Harper, D.D., 70; (1613) *Wadham*, G. E. Thorley, M.A., 99; (1624) *Pembroke*, Evan Evans, D.D., 64; (1714) *Worcester*, W. Inge, M.A., 119; (1869) *Keble*, Robt. James Wilson, 168 ; (1874) *Hertford*, H. Boyd, D.D., 88. Halls: (1269) *St. Edmund's*, E. Moore, D.D., 43; (1325) *St. Mary*, D. P. Chase, D.D., 35; (1392) 'Non-collegiate,' and students at private halls, 255—total 2,972. *Charsley's Hall* and *Turrell's Hall*, though private halls, may be counted with the univ. halls, as they hold a license from the vice-chancellor. But the present system of univ. teaching is not very favorable to either the increase or the progress of unattached students.

See OXFORD: BODLEIAN LIBRARY: RADCLIFFE LIBRARY: also consult Ayliffe's *History of Oxford*, Wood's *Athenæ Oxonienses*, the *University Calendar*, Parker's *Handbook to Oxford* (1875), the *Student's Handbook to the University of Oxford*, and H. C. Maxwell Lyte's *History of Oxford University* (1885).

OXIDE, n. *ŏks'īd* [Gr. *oxus*, sour, acid; *oxos*, vinegar:

F. *oxyde*]: a compound of oxygen with another element, as the rust of iron. OXIDABLE, a. *ŏks′ĭ-dă-bl*, capable of being converted into an oxide. OXIDATE, v. *ŏks′ĭ-dāt*, to convert into an oxide. OX′IDATING, imp. OX′IDATED, pp. OX′IDA′TOR, n. *-dā′tėr*, a contrivance for throwing a current of air on the flame of an argand lamp; also called *oxygenator*. OX′IDA′TION, n. *-shŭn*, the process of converting metals and other substances into oxides; term applied to the union of any body with oxygen, the body being then said to be *oxidized*, and the resulting compound being termed an *oxide*. Many bodies possess the property of entering into several distinct combinations with oxygen—e.g., manganese (Mn) forms no less than five such compounds—viz., MnO, Mn_3O_4, Mn_2O_3, MnO_2, $Mn{\cdot}O_3$, which represent different stages of oxidation. OX′IDIZE, v. *-dīz*, to convert into an oxide; to become an oxide. OX′IDIZING, imp. OX′IDIZED, pp. *-dīzd:* ADJ. converted into an acid by combination with oxygen. OX′IDIZABLE, a. *-dī-ză-bl*, capable of being oxidized. OX′IDIZER, n. *-zėr*, that which oxidizes. METALLIC OXIDES, the most important of all the compounds of the metals, and frequently occurring naturally as abundant and valuable ores. They are divided by chemists into three classes—viz., (1) basic oxides or bases, (2) saline or indifferent oxides, and (3) acid oxides or metallic acids. The different oxides of the same metal usually afford illustrations of two, and frequently of all three, of these classes—e.g., of manganese, the protoxide, MnO, is a powerful base; the red oxide, Mn_3O_4, is a saline or indifferent oxide, showing little tendency to combine with either acids or alkalies; while permanganic acid, $H_2Mn_2O_8$, presents all the properties of an acid. 'As a general rule, the greater the number of atoms of oxygen which an oxide contains, the less is it disposed to unite with the acids; on the contrary, it frequently possesses acid properties, and then unites with bases to form salts. Protoxides generally are strong salifiable bases; they require one equivalent of a monobasic acid to form neutral salts. Sesquioxides are weaker bases; their salts are usually unstable; they require three atoms or equivalents of a monobasic acid to form a salt neutral in composition, though it may not be neutral to test-paper; and, in general, all oxides require as many equivalents of acid as they contain atoms of oxygen in their composition. Some of the metallic acids, like the stannic and titanic, contain two atoms of oxygen to one atom of metal, but most of them contain three atoms of oxygen—e.g., the manganic, ferric, chromic, tungstic, molybdic, and vanadic acids; while in a few cases, such as the arsenic, antimonic, and permanganic, the proportion of oxygen is still higher.'—Miller's *Inorganic Chemistry*, 2d ed., 314. Of the basic oxides, which form by far the most important class, it may be observed that they are devoid of all metallic appearance, and present the characters of earthy matters, **and that only six of them are soluble in water to any**

considerable extent—viz., the three alkalies, and baryta, strontia, and lime. All the oxides are solid at ordinary temperatures, and, as a general rule, the addition of oxygen to a metal renders it much less fusible and soluble; the protoxide of iron, the sesquioxide of chromium, and molybdic acid being the only oxides that melt more readily than the metal.

OXLEYA, *ŏks′lĭ-a:* genus of trees of nat. order *Cedrelaceæ*, of which one species, *O. xanthoxyla*, the YELLOW WOOD of e. Australia, is a very large tree, 100 ft. high, valuable for timber.

OXLIP: see under OX: see PRIMROSE.

OXON., *ŏks′ŏn:* an abbreviation for Oxonia; sometimes placed by a graduate after his degrees, to indicate that they have been derived from the Univ. of Oxford.

OXONIAN, n. *ŏks-ō′nĭ-ăn:* a student or member of the Univ. of Oxford.

OX′-PECKER (Bird): see BEEF-EATER.

OXTER, n. *ŏks′tėr* [AS. *oxtan*, the armpits]: in *Scot.* and also *prov. Eng.*, the armpit.

OXUS, *ŏks′ŭs:* ancient name of a great river in central Asia, called by the Turks and Persians JIHÛN, and AMÛ or AMÛ-DARIA by the natives of the country through which it flows. The O. rises in Lake Sari-kol, in the elevated plateau which separates e. and w. Turkestan; flows through Buddakshan, Bokhara, and Khiva; and empties by several mouths into the Sea of Aral; length about 1,150 m. In the first part of its course, its volume is increased by numerous affluents; but it receives no tributaries after entering Khiva, from which point its course is wholly through a dry sandy desert. The value of the O. for water communication is said by recent Russian geographers to have been much overrated in Europe; and they add that, in summer, vessels of even slight draught could float on the stream only by shutting off the irrigation canals, and risking the desolation of the country dependent on them for its crops. The true value of the O. is its irrigating power for the sterile alluvial wastes through which it runs. Before the Christian era, it is believed that the O. flowed into the Caspian, and that since 600 it has twice changed its course (see ARAL). A great part of the old bed of the O. has recently been explored by M. Stebnutzki (*Bulletin de la Soc. de Géogr. de Paris*, 1871, Apr.), who has ascertained that it has a fall toward the Caspian, from which he infers that its course was changed, not by an upheaval of the Turcoman desert, but by the simple accidents of fluvial action on an alluvial soil.—See *A Journey to the Source of the Oxus*, by John Wood, with Essay of the Geography of the Oxus Valley by Col. Yale, 1873; *The Road to Merv*, by Sir H. Rawlinson, in Proceedings of the Geog. Soc., 1879.

OXYACID, *ŏks′ĭ-ăs-ĭd*, or OX′-ACID: an acid that contains oxygen. When Lavoisier, 1789, gave the name oxygen to the *Dephlogisticated Air* discovered, 1774, by Priestley, he believed that the presence of oxygen was essential to the existence of an acid; and this view was supported by the composition of the principal acids then known, e.g., sulphuric, nitric, carbonic, and phosphoric acids. But, by degrees, acids were discovered into which no oxygen entered, but which always contained hydrogen; thence acids were divided into two great classes, *oxyacids* and *hydracids ;* oxygen being supposed to be the acidifying principle in the former, and hydrogen in the latter. At the present day, scientific chemists usually restrict the term *acid* to compounds into which hydrogen enters, and the acids are regarded as salts of hydrogen; thus, sulphuric acid, H_2SO_4, and nitric acid, HNO_3, are the sulphate and nitrate of oxide of hydrogen; hydrochloric acid, HCl, is chloride of hydrogen, etc.

OXYCHLORIDE, *ŏks-ĭ-klō′rīd:* chemical compound containing both chlorine and oxygen in combination with some other element or radical. Chloride of lime, $CaOCl_2$, chloride of potash, KCl, oxychloride of lead or Turner's yellow, belong to this class.

OXYGEN, n. *ŏks′ĭ-jĕn* [Gr. *oxus*, acid; *gennăō*, I generate or produce]: that elementary gaseous body which gives to air its power of supporting respiration and combustion, and which, by its union with hydrogen, forms water. OX′YGENATE, v. *-āt*, to cause to combine with oxygen. OX′YGENATING, imp. OX′YGENATED, pp. OX′YGENATION, n. *-ā-shŭn*, the act or process of combining with oxygen. OX′YGENATOR, n. *-ā-tėr*, the same as OXIDATOR: see under OXIDE. OX′YGENIZE, v. *-īz*, to unite, or to cause to unite, with oxygen; to convert into an oxide. OX′YGENIZING, imp. OX′YGENIZED, pp. *-īzd.* OX′YGENIZER, n. *-zėr*, that which oxygenizes. OX′YGENIZABLE, a. *-ză-bl*, that may be oxygenized. OXYGENOUS, a. *ŏks-ĭj′ĕn-ŭs*, pertaining to or obtained from oxygen.—*Oxygen* (sym. O, at. wt. 16, sp. gr. 1·1056) is a colorless, inodorous, tasteless gas, long regarded as a 'permanent' gas, but liquefied by Pictet of Geneva for the first time 1877. Its chemical affinities for other elementary substances are very powerful; with most of them it is found in combination, or may be made to combine, in more than one proportion; with several in 4, 5, or 6 proportions; and there is only one element (fluorine) with which it does not enter into any combination. Owing to the intensity with which many of these combinations take place, this gas has the power of supporting Combustion (q.v.) in an eminent degree. Of all known substances, it exerts the smallest refracting power on the rays of light. It possesses weak but decided magnetic properties, like those of iron, and, like this substance, its susceptibility to magnetization is diminished or even suspended by a certain elevation of temperature.

It is only slightly soluble in water; 100 cubic inches of that liquid dissolving 4·11 cubic inches of gas at 32°, and only 2·99 inches at 59°.

O. gas is not only respirable, but is essential to the support of animal life; hence it was termed *vital air* by some of the older chemists. A small animal placed in a bell-glass containing pure oxygen will not be suffocated so soon as if it were placed in the same glass filled with atmospheric air. For further details on this property of O., see RESPIRATION. O. is the most abundant and most widely distributed of all the elements. In its free state (*mixed* but not *combined* with nitrogen), it constitutes about a fifth of the bulk, and considerably more than a fifth of the weight, of the atmosphere. In combination with hydrogen, it forms eight-ninths of all the water on the globe; and in combination with silicon, calcium, aluminium, etc., it enters largely into all the solid constituents of the earth's crust; silica in its various forms of sand, common quartz, flint, etc.—chalk, limestone, and marble—and all the varieties of clay, containing about half their weight of oxygen. It is, moreover, found in the tissues and fluids of all forms of animal and vegetable life, none of which can support existence independently of this element.

There are various modes of obtaining O., the simplest of which consists in the exposure of certain metallic oxides to a high temperature. It was originally obtained by its discoverer, Dr. Priestley, from the red oxide of mercury, which, when heated to about 750°, resolves itself into metallic mercury and O. gas. It may be obtained similarly from red oxide and peroxide of lead, the resulting products in these cases being protoxide of lead and oxygen. The following are the chief methods now employed: (1) The black oxide (or dioxide) of manganese, MnO_2, is much employed as a source of this gas. The mineral is reduced to small pieces about the size of a pea, and introduced into an iron bottle, with a pipe through which the gas may escape. When the bottle is placed in a furnace, and attains a red heat, the mineral parts with one-third of its oxygen, and the red oxide of manganese, $MnO\cdot Mn_2O_3$, remains behind, the reaction being explained by the equation:

Black Oxide of Manganese.		Red Oxide of Manganese.		Oxygen.
$3MnO_2$	$=$	$MnO\cdot Mn_2O_3$	$+$	$2O$

(2) A more convenient method is by decomposition of chlorate of potash by heat. That salt, when heated alone, yields pure O. gas, the residue being potassium chloride:

$$2KClO_3 = 2KCl + 3O_2.$$

When it is not essential that the O. obtained shall be quite pure, the chlorate of potash is mixed with about $\frac{1}{10}$ its weight of dry peroxide of manganese. When this mixture is heated, the O. is disengaged very rapidly. (3) Various processes have been proposed for obtaining the gas on a large scale. The following is the one recommended by Ste. Claire Deville and Debray: The vapor of hydrated sulphuric acid is passed over red-hot platinum, by which it is decomposed into O. and sulphurous acid, the latter of which may easily be separated (and made available for the formation of sulphites) by its solubility in water or alkaline solutions. Another process, now worked on a manufacturing scale, was invented lately by M. M. Brin. Atmospheric air, freed from moisture and carbonic acid, is passed through retorts containing heated anhydrous oxide of barium, free from carbonates and nitrates. Here the O. is absorbed, while the nitrogen passes to a receiver. When the baryta can absorb no more O., the retorts are disconnected with the air supply and the nitrogen-receiver, and are connected with the oxygen-holder. Increased heat is now applied to the retorts, and a partial vacuum produced in the oxygen-holder. This causes liberation of the absorbed O., leaving the baryta ready for a repetition of the process. For the compounds of O., see the titles of the other chemical elements.

O. was discovered almost simultaneously, 1774, by Priestley and by Scheele, the English chemist having precedence by a few weeks. Priestley gave it the name of *Dephlogisticated Air;* Scheele termed it *Empyreal Air;* Condorcet shortly afterward suggested *Vital Air*, as its most appropriate designation; and 1789, Lavoisier —who, by a series of carefully conducted and very ingenious experiments, proved that the combustion of bodies in the air consisted essentially in their chemical combination with O., and thus overthrew the *Phlogiston* (q.v.) theory—gave it the name which it now retains, in consequence of his (erroneously) believing that its presence was necessary to the existence of an acid: see OXYACID.

As to the use of O. in medicine, authorities differ. At its discovery, much was expected from its use by inhalation, as an invigorator of the blood. Drs. A. H. Smith and B. W. Richardson claim to have shown the general rule that the lungs cannot absorb more O. than about the quantity contained in the atmosphere; and experiments by Bucheim tend to confirm their view. There seems, however, no reason to doubt that O., administered in the same manner as 'laughing gas,' has been greatly beneficial in some classes of pulmonary affections, in chronic bronchitis and laryngitis, and in asphyxia from inhaling charcoal fumes.

OXYHYDROGEN BLOW′PIPE, *ŏks-ĭ-hī′drō-jĕn:* instrument for producing an intensely hot flame by burning in combination the two gases hydrogen and oxygen. The most efficient form of the O. B. is, no doubt, that invented by Newman—a strong copper reservoir and a glass tube or nozzle about 4 in. long and $\frac{1}{80}$-in. bore. In the reservoir was held, under 2 to 3 atmospheres' pressure, a mixture of the two gases in the proportion of 2 volumes of hydrogen to one of oxygen. The gases were ignited on issuing from the nozzle. To increase the volume of the flame, Newman substituted a $\frac{1}{20}$-in. nozzle in place of the 1/[illegible]-in.; but the flame travelled back and exploded the gases in the reservoir. The result led to the disuse of Newman's apparatus, and the general adoption of Hare's O. B. In this, the hydrogen (or coal gas) streams out of the annular space between two coaxial tubes, while oxygen is being blown into the hydrogen flame through the central tube. The calorific effect is second only to that of the electric arc: even silica and alumina (absolutely infusible in any furnace) run into viscid glasses under the oxyhydrogen blowpipe.

OXYHY'DROGEN LIGHT: see DRUMMOND LIGHT.

OXYHY'DROGEN MI'CROSCOPE: see SOLAR MICROSCOPE.

OXYMEL, n. *ŏks'ĭ-mĕl* [Gr. *oxus*, acid; *meli*, honey]: a mixture of vinegar and honey.

OXYMORON, n. *ŏks'ĭ-mō'rŏn* [Gr. *oxus*, acid, sharp; *mōros*, dull, stupid]: a figure of speech in which an epithet of quite an opposite signification is added to a word, as, a wooden milestone, a cruel kindness.

OXYOPIA, n. *ŏks'ĭ-ō'pĭ-ă* [Gr. *oxus*, acid, sharp; *ōps*, the eye, *ōpos*, of the eye]: preternaturally acute vision.

OXYPHONE, n. *ŏks-ĭf'ŏ-nē* [Gr. *oxus*, acid, sharp; *phōnē*, the voice]: acuteness or shrillness of voice.

OXYRHYNCHUS, *ŏks-ĭ-rĭng'kŭs:* celebrated Egyptian fish, said to be reverenced throughout Egypt, and sacred to the goddess Athor. Its name in Egyptian is *kha*, and the fish in the hieroglyphs was used for this syllable, and expressed particularly the idea of the body. In the ritual, the deceased stated definitely that he had not caught this fish. The name appears to have comprised the genus *Mormorus*, distinguished by its pointed nose and long dorsal fin. The fish was worshipped in one of the nomes, which was called after it, and the inhabitants held it in such reverence that they would not touch any fish captured by a hook. When the portions of the body of Osiris were flung into the Nile, this fish alone ate one portion of his body. The O. was not eaten in Egypt, except by the natives of the Cynonopolites Nomos. Its modern name is *Mizeleh*, which seems retained in the Coptic Pemge, the name of the city of Oxyrhynchus. It is represented both in the sculptures and on the coins of the Nome, and was anciently embalmed.—The city of O. is the modern Behneseh, on the w. bank of the Nile, in lower Egypt, near the Bahr-el-Jusuf.

OXYSALT, n. *ŏks'ĭ-sawlt* [*oxygen*, and *salt*]: a salt into the composition of which oxygen enters.

OXYTONE, a. *ŏks'ĭ-tōn* [Gr. *oxus*, acid, sharp; *tonos*, a tone]: having an acute sound; in *Gr. gram.*, having the accent on the last syllable: N. an acute sound.

OXYTRICHIDÆ, *ŏk-sĭ-trĭk′ĭ-dē* [Gr. *oxytricha*, name of a genus of animalcules, and termination *-idæ*]: family of hypotrichous ciliate *Infusoria*, containing the type-genus Oxytricha and more than 20 other genera of free-swimming animalcules. They inhabit either fresh or salt water.

OXYTROPIS, *ŏk-sĭt′rō-pĭs* [Gr. *oxu*, sharp; *tropis*, keel]: genus of *Astragaleæ*, distinguished from *Astragalus* by the sharp appendage on the keel-petals. About 200 species are known, found in mountainous regions of Europe, Asia, and N. America. Among the Amer. species of O. is *O. lamberti*, one of the plants known as loco-weed, crazy-weed, etc.

OXYURICIDE, *ŏk-sĭ-ū′rĭ-sīd* [Gr. *oxyuris*, pinworm; suffix *-cide*]: medicine intended to destroy pinworms.

OXYURIS VERMICULARIS, *ŏks-ĭ-ū′rĭs vėr-mĭk′ū-lėr-ĭs:* name in recent zoology for the intestinal worm described as *Ascaris* (q.v.) *vermĭcularis;* yet it is the original and true Ascaris. For the mode of recognizing the presence of this worm, and treating patients suffering from it, see VERMIFUGES: WORMS.

OXYUS, *ŏk′sĭ-ŭs* [from Gr. *oxus*, sharp]: in sponges, a spindle-shaped spicule, such as occurs in the genus *Spongilla*.

OYER, n. *ō′yėr* [Norm. F. *oyer;* F. *ouir;* OF. *oir*, to hear—from L. *audīrĕ*, to hear]: hearing or trial of causes in law, particularly in case of a claim or a defense by a deed, when it is said of the opposite party that he has a right to have oyer (i.e., hearing) of the deed as read in court. Oyer was abolished in England 1852; and is practically disused in the United States—other forms of process being employed for securing production of instruments in court. OYER AND TERMINER, *tėr′mĭn-ėr* [F. to hear and determine]: court constituted, in England by a commission, in the United States by statute, to hear and determine criminal causes.

OYEZ, or OYES, int. *ō-yĕs′* [Norm. F. *oyez*, hear ye, imp. of *oyer*, to hear]: the introductory cry of an official connected with a court of law, or of any public crier, requiring silence or attention, which is thrice repeated.

OYLET, n. *oy′lĕt* [F. *œillet*, a little eye]: an eyelet; a scar resembling an eyelet-hole.

OYSTER, n. *oys'tėr* [OF. *oistre;* Icel. *ostra;* AS. *ostre;* Ger. *auster*, oyster—from L. *ostrĕă;* Gr. *ostrĕŏn*, an oyster]: bivalve shell-fish, much esteemed for food (see below). **Oys'terling**, n. little oyster. **Oyster-bed**, breeding-place for oysters; a bank in a tidal river, or other water on or near the sea, where oysters are fattened for sale. **Oyster-patty**, a pasty with oysters baked.

OYSTER, *oys'tėr* (*Ostrea*): genus of lamellibranchiate mollusks, of the section with a single adductor muscle: see LAMELLIBRANCHIATE. The shell consists of two unequal and somewhat irregularly shaped valves, of laminated and coarsely foliated structure; and the hinge is without tooth or ridge, the valves being held together by a ligament lodged in a little cavity in each. The animal is, in its organization, among the lowest and simplest of lamellibranchiate mollusks. It has no *foot;* and, except when very young, no power of locomotion, or organ of any kind adapted to that purpose. Its food consists of animalcules; also of minute vegetable particles, brought to it by the water, a continual current of which is directed toward the mouth by the action of the gills. The gills are seen in four rows when the valves of the shell are separated, a little within the fringed edge of the mantle. In the most central part is the adductor muscle; toward the hinge is the liver, which is large; and between the adductor muscle and the liver is the heart, which may be recognized by the brown color of its auricle. The mouth—for, as in the other lamellibranchiata, there is no head—is situated beneath a kind of hood, formed by the union of the two edges of the mantle, near the hinge. It is jawless and toothless. The ovaries are very large during the season of reproduction, which extends over certain months in summer, when oysters are out of season for the table: these months are familiarly said to be the four whose names are without the letter *r*—May, June, July, August. Oysters are hermaphrodite; or, rather, as the researches of Hoek have shown, there occurs in the same individual an alteration of sex. They begin to spawn when about a year old, and produce vast numbers of young. Leeuwenhoek calculated that 3,000 to 4,000 exist within an O. at once when 'sick,' 'milky,' or full of spawn; and, according to Poli, one O. produces about 1,200,000 eggs. The eggs of the European species are hatched within the shell and mantle of the parent, and the young are seen swimming slowly in a whitish and mucous or creamy fluid surrounding the gills, which becomes darker and of muddy appearance when they are about to be expelled. Each young O. is then about $\frac{1}{120}$ of an inch in length, and about two millions are capable of being packed in the space of a cubic inch. When the parent O. expels the young, and this is done simultaneously by multitudes on an oyster-bank, the water becomes filled as with a thick cloud, and the spawn—called *spat* by fishermen—is wafted away by currents; the greater part, of course, to be generally lost, by being driven to unsuitable situations, as exposed rocks, muddy ground, or sand to which it cannot adhere, or to be devoured by fishes and other marine animals; but some to find an object to which it can attach itself for life. The young come forth furnished with a temporary organ for swimming, ciliated, and provided with powerful muscles for extending it beyond the valves and withdrawing it at pleasure; and when the O. has become fixed in its permanent place of abode, this organ, being no longer of any use, has been supposed to drop off, or gradually to dwindle away and disappear. Frank Buckland several years ago expressed the opinion that the swimming organ of the young O. is the 'lungs,' and remains as the 'lungs' in the mature O. The four figures here represent the young O. much magnified. Figs. 1, 3, 4, are views of the upper and under side; fig. 2 is an edge view. In very favorable situations, oysters grow rapidly, so that the Common O. is ready for the table in a year and a half or two years; but in other places, a longer time is required, often about five years.

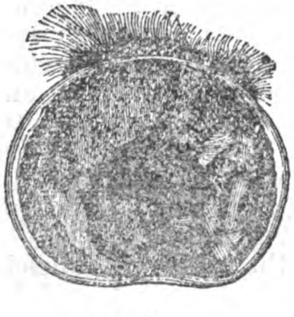


Fig. 1.

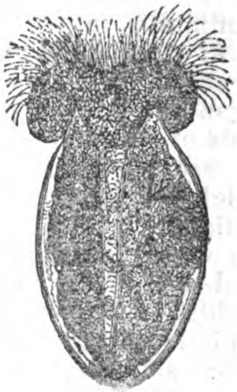


Fig. 2.

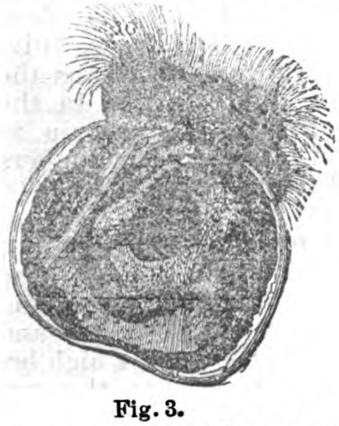


Fig. 3.

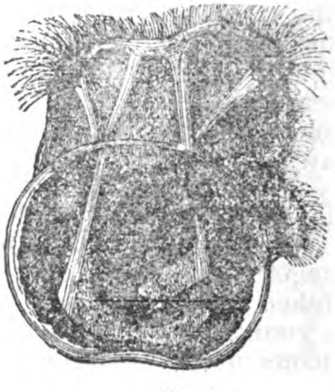


Fig. 4.

It has been said that in the American species the eggs are hatched not within the parent shell, but in the water outside, where the fertilization takes place with the mingling of the spawn discharged from the male and female. The fact is, rather, that in the Amer. O. there is no period of incubation within the mantle-cavity of the parent. The spawning season in Europe is May-Sept.; in the U. S., Apr.-Oct. The American O. is exceedingly prolific, producing 16,000,000 and even as many as 60,000,000 young—from 5 to 50 times as many as the European oyster; but this advantage is much more than counterbalanced by the much smaller number of the young of the American O. that pass safely through the perils incident to the early stages of the oyster's life. The European oyster takes some little care of its young, keeping them for several days within the folds of the mantle; but in the case of the American O., fertilization takes place in the water, and the embryotic oysters are from the first moment of their existence exposed to innumerable dangers. The growth of the American O. is much more rapid than that of the European. When 2 weeks old, it is of the size of a pin-head; after 3 months, it is as large as a pea; then the rate of growth is accelerated, and after the sixth month the young O. is an inch long. It is ready for market after 3 years. The average age of the American O. is 10 yrs.; but some have been known to live 30 yrs. Old oysters sometimes attain great size—3 ft. long by 2 ft. broad. In the O. industry of the United States there were (1880) 52,805 persons employed; capital invested $10,583,295; sale value of the product $13,438,852.

The species of O. are numerous (70 have been distinguished), and are found in the seas of all warm and temperate climates. None have been found in the coldest parts of the world. The COMMON O. (*O. edulis*) is the European species. Like it, the other species are generally found where the water is of no great depth; and some of them, also like it, are very abundant in estuaries, where the water is not very salt. Yet oysters do not thrive in water with less than three per cent. of salt, e.g., in the Baltic. The mangrove swamps of warm climates often abound in oysters of excellent flavor (*O. parasitica*, etc.), adhering to the roots and branches of the trees, within the reach of the tide. Some of the species differ from the Common O. not a little in form, as the LONG-HINGED O. (*O. Canadensis*) of N. America, which is very elongated; and some of them far exceed it in size. Sir J. E. Tennent states that he measured the shell of an edible O. in Ceylon, and found it a little more than 11 inches in length by half as many in breadth; 'thus unexpectedly attesting the correctness of one of the stories related by the historians of Alexander's expedition, that in India they had found oysters a foot long.' Some species of O. have the valves plaited with strong longitudinal plaits. The Amer. O. closely resembles the European. The species on the Atlantic coast are *O. Virginiana* and *O. borealis*; on the Pacific, *O. conchafila* and *O. lurida*. The most abundant supplies are from Chesapeake and Delaware bays, the N. J. coast, and Long Island Sound. The American O. is much larger than the European, and lacks the coppery taste of the latter.

Young oysters readily attach themselves to the shells of old ones, and thus, in favorable circumstances, oyster-banks increase rapidly, so as to fill up shallow parts of the sea, and to form walls which effectually resist the waves and tide. This is remarkably the case on the alluvial shores of Ga. and some other parts of N. America, where these banks are called *Raccoon Banks*, because the raccoon, among other animals, visits them to feed upon the oysters. Marshy land extends inward 12 to 18 m. from the sea, with tidal rivers meandering through it; and these rivers are kept to their channels by the walls of living oysters on both sides. Large bunches of oysters may even be found among the long grass. It is not unusual for the inhabitants to light a fire and roast a bunch of oysters on the spot. So abundant are the oysters in many places, that a vessel of 100 tons might be loaded within three times her own length. American oysters, which are of excellent flavor, have for years been exported (alive) into Britain, to the value of hundreds of thousands of dollars a year.

Notwithstanding the prodigious fecundity of the O., however, the beds or banks which yield it for the markets of European countries are not sufficiently productive to satisfy the demand; and in Europe it is not so much an article of ordinary food for all classes, as a luxury of the wealthy. The usual mode of taking oysters by dredging is destructive, though, for oyster-beds, which are at all states of the tide covered with a considerable depth of water, nothing better has been devised; and the anxiety of fishermen to make the most of the present opportunity has caused many beds to be almost ruined by overdredging. But the artificial formation of oyster-beds has been successful. In the United States there is much replanting, at the north and on the Pacific coast, of oysters taken from Chesapeake Bay. Oyster-culture is indeed no novelty, having been practiced by the Romans. Among the *vivaria* of later emperors and other wealthy Romans were *ostrearia*, specially for oysters; and oyster-culture has never ceased to be practiced in Italy, though to an inconsiderable extent, and particularly in the Lake of Fusaro (q.v.), the Acheron of Virgil, a muddy salt-water pond, nowhere more than 6 ft. deep.

The English plan of oyster-culture as practiced at Herne Bay, Reculver, Whitstable, Langston Harbor, Isle of Wight, etc., depends on the provision of salt-water tanks or ponds, in which the oysters are kept for a time. In France, the system is much more elaborate. The coast is parted into divisions or districts, each placed under a maritime prefect, and divided and subdivided into smaller portions, managed by commissioners, inspectors, syndics, and watchmen. The determination of 'close-time,' when oyster-fishing is totally prohibited; the decision how much to fish up, and how much to reserve for restocking; the discrimination between public oyster-beds and those made over to individuals by 'concessions;' the control of the fore-shore; the maintenance of oyster-breeding farms; the prevention of poaching by fishers not belonging to the respective districts—occupy quite an army of officials. In 1872, the enhanced price of oysters in France attracted much public attention. Close observers arrived at an opinion that it was due to three causes—impoverishment of some of the beds by injudicious dredging; greatly increased demand for the supply of Germany and Russia; and a private understanding between many of the French companies, leading to something very like a monopoly. The price per 100 was 1·20 francs in 1840, 2·83 francs in 1856, 4·58 francs in 1860, 7·20 francs in 1868, and 11·20 francs in 1872. For consumption and further development, about 380,000,000 oysters were taken 1881 from the basin of Arcachon, where the govt. has preserved banks, and the beds of Marennes and Concarneau; while, 1880, from 21 places where this industry is carried on, about 195,000,000 were sent to market.

Oyster-culture is receiving much attention in Australia. Oyster-farms were established in New South Wales and in Victoria 1872.

Oysters live equally well in situations where they are constantly under water, and in those left dry by the retiring tide. In 1882, a discovery was made of 10,000 acres of oyster-beds in the North Sea, 20 fathoms deep, extending over a length of 200 m., and a breadth of 60 or 70—unhappily not easily dredged. Where ebb-tide leaves oysters dry, they instinctively keep their valves closed when the water deserts them. In such situations oyster-culture is most easily carried on. Various methods are adopted of preparing the artificial oyster-bed, by providing suitable solid objects for the oysters to attach themselves to. Stones are piled together, and in such a way that there are many open spaces among them; stakes are driven into the mud or sand; bundles of small sticks are fastened to stones or stakes; floors of planks are formed, at a little height above the bottom, with alleys between them, the under surface of the planks being roughened by the adze; and tiles are arranged in various ways, so as to turn to account the whole space at the disposal of the oyster-cultivator as high as the ordinary tides reach. The method must be varied in accordance with the situation, and the probable violence of winds and waves; but sheltered situations are best in all respects; and experience in France seems to prove that tiles covered with cement are preferable to everything else yet tried, as convenient for the cultivator, presenting a surface to which oysters readily attach themselves, and from which they can easily be removed, while the larger seaweeds do not grow on it so readily as on stones or wood. By the use of tiles covered with cement, the cultivtaor is also enabled easily to remove young oysters from breeding-grounds to feeding-grounds; the best breeding-grounds being not those in which the oyster most rapidly attains its greatest size, and gains that greenish tinge which Parisian epicures desire to see, due to the abundant confervæ and green monads of quiet muddy waters.—It has been long known that the oysters of particular localities are finer than those produced elsewhere. Those of Rutupiceæ, now Richborough, in Kent, England, were highly esteemed by the Romans, whose epicurism in oysters exceeded that of modern nations.

Raw oysters are generally believed to be more nutritious and more easily digested, as to many they are more delicious, than oysters cooked in any way; and it does not appear that any such evil consequences ever ensue from eating them, as are known to ensue from eating other kinds of uncooked food. Probably no parasite capable of developing into any form injurious to the human being exists in the oyster.

The genus *Ostrea* gives its name in some zoological systems to a family *Ostreadæ*. The fossil species are more numerous than the recent. The name O. is popularly extended to many mollusks not included among the *Ostreadæ* as the Pearl-oyster (q.v.). Oysters raised in artificial beds are called 'natives,' and are considered much superior to these dredged from the natural beds; though to these last the name of 'native' would seem more appropriate than to the other.

Fossil Oysters.—A single species occurs in the Carboniferous Limestone, and as we rise in the crust of the earth, the genus becomes more and more common, no less than 200 species having been recorded, many scarcely distinguishable from the living species. The subgenus Gryphæa was a free shell, with a large thick left valve and small concave right valve: 30 species have been found in beds of the Oolite and Chalk periods. In the same beds occurs another form of Ostrea with subspiral reversed umbones, to which the subgeneric name Exogyra has been given: 40 species of this form have been described.

LAW AS TO OYSTERS.—The rule is, that he who has the right of property in the soil or sea-shore is entitled to catch or keep and breed oysters there. But the shore below the medium line of the tides in Britain belongs to the crown, and not to any individual; and in the United States all below low-water mark is under control of the state govt.; and such govts. have power to pass laws restricting the taking of oysters there. In Britain it is only by virtue of some grant from the crown that an individual or a corporation can establish an exclusive title to the sea-shore, and in such a case is exclusively entitled to any oyster-beds there. The laws of some states in the Amer. Union (notably Conn.) provide that any person may acquire an interest in a number of acres of land under water as an oyster-bed, on conforming to the requirements of the statute in relation to staking, giving notice, etc. In such cases the state can confer an exclusive right of ownership; and to take oysters in disregard of such right is larceny. In most of the states the principle prevails that the oyster-beds, with the bottoms of rivers, harbors, etc., are inalienable common property, which the state can only guard and protect for public use, but cannot sell. It has been decided that it is not unconstitutional for a state to make laws restricting the taking of oysters from its shores by citizens of other states. Except in Conn. fishing by steam-vessels is forbidden, also fishing by night, and fishing during the three summer months.—See Lieut. Francis Winslow, in a catalogue of the Economic Mollusca exhibited by the U. S. National Museum at International Fisheries Exhibition, London, 1883.

OYS'TER BAY: town on the n. shore of Long Island, N. Y., on a deep sheltered bay, opening into Long Island Sound, 25 m. n.e. of New York. It has long been a favorite place of summer residence, and is an attractive watering-place. Pop. tp. (1870) 10,595; (1880) 11,923; (1890, census first report) 13,788.

OYS'TER CATCHER (*Hæmatopus*): genus of birds of family *Charadriadæ* (q.v.), chiefly inhabiting sea-coasts, where they feed on mollusks, crustaceans, annelids, and other marine animals—sometimes even on small fishes. Their legs are of moderate length, like those of the plovers, and, like them, they have no hind-toe. The most remarkable generic distinction is found in the bill, which is long, strong, straight, much compressed and wedge-like toward the point. They are generally said to make use of the bill for opening the shells of oysters and other mollusks; but some naturalists have expressed reasonable doubt on this point. The habits of the only European species (*H. ostralegus*), so far as they have been accurately observed, agree with those of the American. It is common on all parts of the British coasts, on those of continental Europe, n. Africa, and n. Asia. Its whole length is about 16 inches. Its finely-contrasted black and white colors have gained

Oyster-catcher (*Hæmatopus ostralegus*).

it the name of SEA PIE. It is most abundant on the seacoast, but often visits inland regions, and sometimes breeds in them. It does not make a nest, but lays its eggs—usually four—on the shingly beach or bare ground. On some sandy flat coasts, the eggs are found in great numbers. The American O., *H. palliatus*, is a bird of passage, deserting the n. regions in winter. It is rather larger than the European species, and differs from it in colors, and in greater length and slenderness of bill.

OYS'TER GREEN: sea-weed, otherwise called SEA-LETTUCE (*Ulva lactuca*), because it is of lettuce-green color, and adheres to oyster-shells. The same name is given to *Ulva latissima* (green laver), and both species are common on the Atlantic coast of N. America. *U. lactuca* is used sometimes medicinally, in combination with lime-juice, in the treatment or for prevention of scrofula. The ancients prescribed it in gout and rheumatism. Its taste is very bitter. *U. latissima* is sometimes eaten as food, but is far excelled by species of an allied genus, *Porphyra* (*P. vulgaris*, *P. laciniata*). O. G. is valuable for the salt-water aquarium, because it thrives in still water.

OYS'TER PLANT: see SALSIFY.

O'ZAKA: see OSACA.

OZANAM, *o-zâ-nŏng'*, ANTOINE FRÉDÉRIC: French critic: 1813, Apr. 23—1853, Sep. 8; b. Milan, Italy; of an ancient and distinguished Jewish family. He was educated at Lyons, and when only 18 years of age published a pamphlet, *Reflexions Sur la Doctrine de Saint Simon*, which attracted wide attention. He went to Paris 1832 to study law; made the acquaintance of Chateaubriand, Ampère, and other noted men, joined the Neo-Catholic movement, and with 7 other students founded 1833 the benevolent and religious organization afterward known as the Society de Saint Vincent de Paul. He was prof. of commercial law in Lyons 1839, the following year became assistant to Fauriel at the Sorbonne, and on the death of Fauriel 1844 succeeded him as prof. of foreign literature. He was a hard worker, a profound scholar, and a popular teacher. He was devotedly attached to the Rom. Cath. Church, and was almost universally respected and beloved. His complete works (11 vols.) appeared in Paris 1862–75, and his *Life* has been published by both German and English authors. Among his principal works are *Dante et la Philosophie Catholique; Études Germaniques; and Les Poëtes Franciscains.* He died at Marseilles.

OZARK, *ō-zârk'*, MOUNTAINS: irregular range of mountains extending from southern Mo. through the n.w. portion of Ark. to the Red river region of the Indian Territory. The elevation does not usually exceed 1,500 ft., but sometimes reaches 2,000 ft. They contain great quantities of iron, and probably of other minerals, are covered with valuable timber, and are noted for beautiful scenery.

OZENA, or **Ozæna**, n. *ō-zē′nă* [L. *ozæna;* Gr. *ozaina*, an offensive ulcer in the nose—from Gr. *ozē*, a stench]: discharge of fetid, purulent, or sanious matter from the nostrils. It is a symptom rather than a disease, and may arise from ulceration of the membrane lining the nostrils, or from caries of the adjacent bones; and may accompany syphilitic, scorbutic, scrofulous, or cancerous affections of these or adjacent parts. A slighter form of O. sometimes follows chronic coryza (or cold in the head), malignant scarlatina, and erysipelas of the face. The discharge is seldom accompanied by acute pain, unless when caused by cancer; sometimes, however, aching is complained of. The prognosis must depend on the nature of the disease causing the discharge. The treatment may be divided into the general or constitutional, and the local. *General treatment* should consist of tonics combined with alteratives, e.g., preparations of bark with the alkalies or with the mineral acids; dry, bracing air, or temporary sojourn at the sea-side, also is usually of service. *Local treatment* consists in inhalation, once or twice a day, of the steam of boiling water, to which a little creosote or carbolic acid has been added; and in more severe cases, in the thorough syringing of the nostrils, to wash away all collections of matter with a copious stream of warm water to which a little chloride of zinc has been added (about 30 minims of Burnett's solution to half a pint of water).

OZIERI, *ō-tsē-ā′rē:* town of the island of Sardinia, province of Sassari, 26 m. e.s.e. from Sassari, among the mountains which occupy the centre of the island. It stands in a deep valley, open only to the n., therefore peculiarly exposed to cold winds. Pop. (1871) 7,965.

OZOCERITE, n. *ō-zo-sē′rīt*, or Ozokerite, n. *ŏz-ŏ′kėr-īt* [Gr. *ozō*, I smell; *kēros*, wax]: one of the mineral resins or fatty matters occurring in shales of the Coal formation; a mineral wax of a rich brown with a green tint, found in immense deposits in Galicia and Moldavia, which is refined and made into candles.

OZONE, n. *ō′zōn* [Gr. *ozō*, I smell; *ozōn*, smelling]: allotropic modification of oxygen, involving contraction of volume, and acquisition of new properties, with great enhancement of energy. **Ozonized**, a. *ō′zŏn-īzd*, charged with or containing ozone. **Ozonometer**, n. *ō′zŏn-ŏm′ĕ-tėr* [Gr. *metron*, a measure]: test employed to detect the presence of ozone in the atmosphere, and the relative quantity contained in it.—*Ozone* has a peculiar odor. This odor was long ago remarked as produced by the working of an electrical machine. Van Marum found that, when electric sparks were passed through a tube containing oxygen, the gas became powerfully impregnated with this odor—which he therefore called the 'smell of electricity.' Subsequent writers attributed the phenomenon to the formation of nitric acid, due to a trace of nitrogen mixed with the oxygen; especially as the gas was found to act energetically on mercury. Thus supposed to be explained, these curious results were soon forgotten. But in 1840, Schönbein (q.v.) made closer investigation and arrived at many curious results, not all even yet satisfactorily accounted for.

The earlier results of Schönbein were as follows: (1) When water is decomposed by the voltaic current, the electrodes being of gold or platinum, the oxygen (which appears at the positive pole) possesses in a high degree the smell and the oxidizing power developed by Van Marum by means of friction-electricity. (2) When the positive electrode is formed of an oxidizable metal, these results are not observed, but the electrode is rapidly oxodized. (3) The oxygen collected at a platinum electrode retains these properties for an indefinite period, if kept in a closed vessel; but loses them by heating, by the contact of an oxidizable substance, and even by contact with such bodies as charcoal and oxide of manganese. To the substance, whatever it may be, which possesses such powerful chemical affinities, Schönbein gave the name ozone, from its peculiar smell. In 1845 he showed that the same substance can be produced by the action of phosphorus on moist air; and suggested that it might be a higher oxide of hydrogen. De la Rive and Marignac shortly afterward, repeating the experiments of Van Marum, showed that electric sparks produce O. even in *pure* and *dry* oxygen; and came to the conclusion, that O. is oxygen in an *allotropic* state, as diamond is a form of coke or charcoal. Baumert, 1853, endeavored to show that there are two kinds of O.—one formed from pure oxygen by electric sparks, which he allowed to be allotropic oxygen; the other formed in the voltaic decomposition of water, which he endeavored to prove to be a *teroxide* of hydrogen (HO_3). But Andrews, 1856, completely refuted this, by showing that no such oxide of hydrogen (at least in gaseous form) is produced in the electrolysis of water; and that O. from whatever source obtained, is the same body; and is not a compound, but an allotropic form of oxygen. In 1860 Andrews and Tait published the results of a

series of *volumetric* experiments on this subject, which led to remarkable conclusions—among which are the following: When the electric discharge is passed through pure oxygen, that gas *contracts*. If O. be oxygen in an allotropic form, it must therefore be denser than oxygen. It was found also that a much greater amount of contraction, and a correspondingly greater quantity of O., were produced by a silent discharge of electricity between fine points, than by a brilliant series of sparks. The contraction due to the formation of the O. is entirely removed by the destruction of the O. by heat and this process can be repeated indefinitely on the same portion of oxygen. In attempting to determine the density of O., they used various bodies to take up the O. from the oxygen containing it; and met with many very curious results. Thus, if mercury be introduced, it is immediately attacked and oxidized, yet the oxygen *increases* in volume. If iodine be employed, it is immediately oxidized, and *no change* of volume is observed: in the researches of Andrews and Tait none was observed, though the apparatus would have at once rendered visible a change to the amount of $\frac{1}{60000}$ of the bulk of the oxygen.

Owing to the impossibility of obtaining O. apart from a relatively large volume of unchanged oxygen, it was many years before the exact relation of O. to common oxygen was determined. It was, however, finally shown, on the basis of experiments made by Soret, 1865–67, and especially as the result of elaborate study by Sir B. Brodie, 1872, that 2 volumes of O. consist of the same matter as 3 volumes of ordinary oxygen, and hence that the molecule of O. must be expressed by the formula O_3 when that of oxygen is O_2.

O. is easily prepared by subjecting ordinary oxygen to the action of the silent electric discharge. For this purpose a stream of oxygen is passed through a tube into which is sealed a pair of very finely-pointed platinum wires with their points at a little distance apart, one being connected with an electrical machine, and the other with the ground. No sparks must be allowed to pass, as in that case a considerable portion of the O. would be reconverted into ordinary oxygen.

O. is insoluble in water and in solution of acids or alkalies. Air charged with it exerts an irritating action in the lungs. O. is decomposed by heat gradually at 212°, instantly at 554°. It is an extremely powerful oxidizing agent, possesses strong bleaching and disinfecting powers; corrodes cork, caoutchouc, and other organic substances; oxidizes iron, copper, and even silver when wetted, as well as dry mercury and iodine. O. was liquefied, 1882, by the French chemists, Hautefeuille and Chappuis, by applying a pressure of 125 atmospheres to richly oxidized oxygen at 148°. Liquid O. is of a dark indigo-blue color,

P

P, p, *pē:* sixteenth letter of the English alphabet, a consonant; with *k* and *t* called a pure mute as producing no sound. P was in Hebrew called *pe*, i.e., mouth, probably from its original form. P is the thin letter of the labial series (*p*, *b*, *f*, *v*), and is interchangeable with the other letters of the series. P, in Sanskrit, Greek, and Latin, is replaced by *f* in the Teutonic tongues. (See F.) Words *beginning* with *p* in English, and its kindred Teutonic tongues, are mostly of foreign origin (Slavic, Celtic, Latin), e.g., *pain* (Fr. *peine*, Lat. *pœna*), *plough* (Pol. *plug*), *pit* (Lat. *puteus*, a well). The Greek prep. *apo* (Skr. *apa*) became in Lat. *ab;* Gr. *hupo*, Lat. *sub;* Skr. *upa*, Lat. *ob;* but before sharp letters, as *t* and *s*, the original *p* was retained in pronunciation, as is shown by inscriptions (*apstulit*, *optinui*). There are remarkable interchanges of *p* with the sharp guttural *k* or *q*. Thus, for Lat. *quis*, *quod*, *quam*, the Oscan dialect had *pis*, *pod*, *pam;* Lat. *equus*, *coquo*, corresponded to Gr. *hippos* (Æol. *hikkos*), *pepo;* similarly, Gaelic *mac* (son), *ceathair* (Lat. *quatuor*, four), *coig* (Lat. *quinque*, five), correspond to Welsh *map*, *pedwar* (Gr. *pettores*), *pump* (Gr. *pente* or *pempe*). In Gr. *p* is sometimes replaced by *t* as *tis*, *tessares*, for *pis*, *pettores*. In such words as *redemption*, *consumption*, *p* has been introduced as an intermediary between the incompatible sounds *m* and *t*. The initial *p* of Latin words has mostly passed into French unaltered; in other positions, *p* has become *v;* thus, Fr. *évêque*, *cheveu*, *décevoir*, *pauvre*, from Lat. *episcopus*, *capillus*, *decipere*, *pauper*.

PAAS, n. *pawss* [L. and Gr. *pascha*, remotely from the Hebrew *pesachh*, the feast of Passover or Easter]: the festival of Easter; sometimes used in the vicinity of New York.

PABULUM, n. *păb'ū-lŭm* [L. *pab'ulum*—from *pasco*, I feed: Sp. *pabulo*]: nourishment; that which feeds; food; fuel. PAB'ULAR, a. *-lėr*, or PAB'ULOUS, a. *-lŭs*, pertaining to food. PAB'ULA'TION, n. *-lā'shŭn*, the act of feeding.

PACA, n. *pā'kă* [Port. *paca*], (*Coelogenys*): genus of rodent quadrupeds, allied to the agoutis, cavies, and capybara, and inhabiting Brazil, Guiana, and some of the W. India Islands. The dentition very nearly resembles that of the agoutis. The cheek-bones are prodigiously developed, in a way of which no example exists in any other mammalian animal, so that the zygomatic arches inclose a large hollow space, while the bone also descends to an unusual depth from the arch, even below the lower jaw-bone. Within this structure, which gives an extraordinary breadth and peculiar aspect to the face, is a sac in each cheek, opening in front, and lined with a fold of the skin of the face. The whole of this seems to be intended to preserve the true cheek-pouches from external shocks. The cheek-pouches open from the mouth in the usual way, and are capable of very great distention. The lip is cloven; the ears are small; the eyes are large and full; the neck is short; the tail is a mere tubercle; the feet have each five toes; the legs are thick; the back is rounded. The form and gait are clumsy, yet the P. (*C. paca*) is very quick and active. It lives in moist grounds, burrowing like the rabbit, but not so deeply; its burrow, however, is always provided with three openings. It feeds on vegetable substances, and often does great damage to plantations of sugar-cane. It is one of the largest rodents, being about two ft. long. It is generally of dark brown color, with four rows of white spots along the sides, the throat and belly white. A lighter-colored species has been described, but is perhaps a mere variety. The flesh of the P. is much esteemed, and is very fat.

PACA, *pā'ka*, WILLIAM: 1740, Oct. 31—1799; b. Wye Hall, Harford co., Md. He graduated from Philadelphia College at the age of 19, studied law in London, practiced at Annapolis, was an ardent patriot, member of the state legislature 1771–74, member of congress 1774–79, signed the Declaration of Independence, was a member of the state senate 1777–79, chief justice of the state of Md. 1778–80, and chief judge of the court of appeals 1780–82, gov 1782–86, member of the Constitutional Convention 1788, was appionted district judge 1789,and held the office till his death. He died at Wye Hall.

PACAY, *pă-kā'* (*Prosopis dulcis*): tree of nat. order *Leguminosæ*, suborder *Mimoseæ;* native of Peru, of rather large size, with a broad head; producing pods 20 to 24 inches long, which contain black seeds imbedded in a sweet flaky substance as white as snow, which is used as food and much relished by the Peruvians.

PACCHIONIAN BODIES, n. plu. *păk'kĭ-ō'nĭ-ăn bŏd'ĭz* [after *Pacchĭōnī*, Italian anatomist]: in *anat.*, numerous small, round, fleshy-looking elevations found on the external surface of the dura-mater, or other cerebral membranes. Their purpose is not known.

PACE, n. *pās* [F. *pas*, a step—from L. *passus*, a step: It. *passo*, a step]: step: measure of five feet: manner of walking: a particular movement, natural to some horses and taught to some others, in which both legs of the same side are lifted together—known also as *racking:* degree of celerity. Pace, in its modern acceptation, is the distance, when the legs are extended in walking, between the heel of one foot and that of the other. Among disciplined men, the pace becomes of constant length, and as such is of the utmost value in determining military movements, the relative distances of corps and men, etc., being fixed by the number of paces marched. The military pace is 2½ ft. for ordinary marching, and 3 ft. for 'double-quick' or running time.—The Roman pace had a different signification, and it is important to bear the distinction in mind, when reading of distances in Latin works; the single extension of the legs was not with the Romans a pace (*passus*), but a step (*gradus*); their pace (*passus*) being the interval between the mark of a heel and the next mark of the *same* heel, i.e., a double step. This pace was equivalent to 4·84 English ft. The pace was the Roman unit in itinerary measure; the mile being 1,000 paces, or 5,000 Roman ft., equal to ·917 of an English mile: see MILE. Whether measurements were effected by actually counting the paces, or by the time occupied, is not clear; but either method would, with disciplined troops, give a safe result. In the middle ages, writers confuse accounts of distances by allusion to a geometrical pace, a measure which varied with different authors. PACE, v. to measure by steps or paces; to walk slowly or deliberately. PA′CING, imp. PACED, pp. *pāst:* ADJ. having a particular or deliberate manner of walking, as slow-paced, applied to horses; trained in any course or movement, as a horse. PA′CER, n. *-sėr*, one who steps or paces. GREAT PACE, a rapid rate of movement, as in walking. SLOW-PACED, a. not prompt or quick. THOROUGH-PACED, a. complete in all respects; going all lengths. TO KEEP OR HOLD PACE WITH, to keep up with; to move as fast as.

PACHA, PACHALIC, etc.: see PASHA.

PACHOMETER, n. *pa-kŏm′ĕ-tėr* [Gr. *pachus*, thick; Eng. *meter*]: an instrument for measuring the thickness of the glass of mirrors.

PACHOMIUS, *pa-kō′mĭ-ŭs:* Egyptian monk: b. toward the end of the 3d c., held in high estimation by the Rom. Cath. Church, as the first to substitute for the free asceticism of the solitary recluse, a regular cœnobitic system. He was brought up as a pagan, but converted to Christianity by the kindness of certain Christians whom he met at Thebes. About A.D. 340, at Tabenna, an island in the Nile, he founded the first monastic institution. The members agreed to follow certain rules of life and couduct drawn up by P., and to subject themselves to his control and visitation. He established also the first convent for nuns, which was under the presidency of his sister; and he labored with so much diligence and zeal, that at his death, according to Palladius, not fewer than 7,000 monks and nuns were under his inspection, The various writings extant under the name of P. are—*Regulæ Monasticæ* (of doubtful genuineness), *Monita, SS. PP. Pachomii et Theodori, Epistolæ et Verba Mystica* (a farrago of unintelligible allegory), and *Præcepta S. Pachomii.*

PACHYCARPOUS, a. *păk'ĭ-kâr'pŭs* [Gr. *pachus*, thick; *karpos*, fruit]: in *bot.*, having the pericarp very thick.

PACHYCORMOUS, a. *păk'ĭ-kŏr'mŭs* [Gr. *pachus*, thick; *kormos*, a trunk]: in *geol.*, denoting a genus of fossil sauroid fishes having thick bodies.

PACHYDACTYL, n. *păk-ĭ-dăk'tĭl* [prefix *pachy-*; Gr. *daktulos*, a finger]: animal having thick toes.

PACHYDERMATA, n. plu. *păk'ĭ-der'mă-tă*, or **PACHY'DERMS**, n. plu. *-dĕrms* [Gr. *pachus*, thick; *derma*, a skin, *dermatos*, of a skin]: order or group of orders of animals distinguished by the thickness of their skins, or having hoofs, as the elephant and horse, and many fossil animals. **PACH'YDER'MATOUS**, a. *-dĕr'mă-tŭs*, thick-skinned. —*Pachydermata*, in the system of Cuvier, constituted an order of Mammalia, including part of the *Bruta* (Rhinoceros, Elephant), and all the *Belluæ* (Horse, Hippopotamus, Tapir, Hog, etc.) of Linnæus, besides one genus (*Hyrax* or Daman) of the Linnæan *Glires*. But subsequent investigation has demonstrated so close an alliance to be unnatural, and probably no other Cuvierian order has been so thoroughly broken up. The elephants and hyrax now form two small independent orders—*Proboscidea* and *Hyracoidea*. The pigs and hippopotami form the non-ruminant division of the ungulate sub-order—*Artiodactyla* (q.v.), while the closely-allied tapir, rhinoceros, and horse represent the perissodactyl ungulates. As defined by Cuvier, the order consists of those hoofed mammalia (*Ungulata*) which are not ruminant; all of which possess, as a more positive character, a remarkable thickness of skin. This order he divides into three sections—(1) *Proboscidea*, having a prolonged snout or proboscis, through which the nostrils pass as elongated tubes, a powerful organ of prehension, and a delicate organ of touch, and having also five toes on each foot, inclosed in a very firm horny skin: (2) *Ordinaria*, destitute of proboscis, though in some (Tapirs), there is such an elongation of the upper lip and nostrils as approximates to it; and the nose is employed by hogs, etc., in seeking their food, not only as an organ of smell, but as an instrument for turning up the ground, and as an organ of touch; the number of toes varies, four, three, or two on each foot; those with an even number of toes having in the cleft foot a resemblance to the *Ruminantia*: and (3) *Solidungula*, in which the foot has but one apparent toe, inclosed in a hoof. Some naturalists have thought it better to separate the *Solidungula* or *Equidæ* (q.v.) from the P., as a distinct order; while others have enlarged instead of restricting the limits of the order, by adding, as a fourth section, the *Herbivorous Cetacea*, now known as *Sirenia*.

Those P. which have a number of toes differ completely from the mammalia having claws (*Unguiculata*) in their inability to bend their toes in order to seize any object. Some of the *Edentata* have very large hooflike claws, but this difference still subsists. The fore-limbs of the P. are also incapable of any rotatory motion, serving for support and locomotion only, not at all for prehension; the metatarsal and metacarpal bones being consolidated as in the *Ruminantia*; and they have no clavicles.

The largest terrestrial mammalia belong to this order. Most of the P. are of large size, though the damans are a remarkable exception, and some of the hog family also are comparatively small. Most of them have a clumsy form, with slow and awkward gait; but they are capable of activity beyond what might be supposed, and sometimes move at a rapid pace. Gracefulness and fleetness are characteristics of the otherwise exceptional *Solidungula*. The *P. Ordinaria* have generally great strength, and the larger ones push their way through the entangled thickets of tropical forests, bending or breaking the lianas, small trees, and branches which oppose their progress, their thick hides resisting the spines and broken branches by which the skins of other animals would be pierced. The horse and other *Solidungula* are not inhabitants of forests and jungles, but generally of grassy plains, and their hides are much less thick and hard than those of most of the Pachydermata.

The physiognomy of the P. in general is rather dull and unexpressive, the eyes being small, and having that character of which a familiar example is the common hog. When enraged, however, they manifest their fierceness in their eyes; and though, in general, mild and gentle, they are capable of being aroused to great fury. The skeleton of the *P. Ordinaria* and *Proboscidea* is strong and massive; the neck short, the processes of its vetebræ are strongly developed; the skull affording a large surface for the muscles which support and move it. The P. generally feed on vegetable substances. Some are omniverous. The digestive organs are more simple than in the *Ruminantia*, but exhibit considerable diversity. The stomach is simple in some, and in others is more or less divided into sacs, approaching to one of the most remarkable characters of the *Ruminantia*. The intestines are generally longer than in the *Ruminantia*. The dentition exhibits considerable diversity; the adaptation to vegetable food being the prevalent character. For the most important peculiarities of the dentition and digestive organs, see the titles of particular families and genera.

PACHYOPTEROUS, a. *păk'ĭ-ŏp'tėr-ŭs* [Gr. *pachus*, thick; *pteron*, a wing]: thick-winged.

PACHYSPONDYLUS, n. *păk'ĭ-spŏn'dĭ-lŭs* [Gr. *pachus*, thick; *spon'dulos*, more commonly *sphondulos*, a joint of the backbone]: a generic term applied to the fossil vertebræ of certain large lizard-like animals.

PACIFIC, a. *pă-sĭf′ĭk* [F. *pacifique*—from L. *pacĭfĭcus*, peacemaking—from *pax* or *pacem*, peace; *făcĭō*, I make: It. *pacifico*]: peacemaking; conciliatory; appeasing; calm. PACIF′ICALLY, ad. *-ĭ-kăl-lĭ*. PACIF′ICA′TION, n. *-kā′shŭn*, the act of peacemaking. PACIF′ICA′TOR, n. *-kā′tėr*, one who makes peace. PACIF′ICA′TORY, n. *-kā′tėr-ĭ*, tending to make peace. PAC′IFY, v. *păs′ĭ-fī* [F. *pacifier*—from L. *pacĭfĭcārĕ*, to pacify]: to restore peace to; to quiet or appease; to allay excitement or agitation; to soothe; to tranquillize. PAC′IFYING, imp. PAC′IFIED, pp. *-ĭ-fīd*. PAC′IFIER, n. *-fī-ėr*, one who pacifies or quiets.—SYN. of 'pacific': mild; gentle; quiet; peaceful; peaceable; tranquil.

PACIF′IC OCEAN: largest of the five great oceans (see OCEAN). It lies between America on the east, and Asia, Malasia, and Australasia on the west. The name 'Pacific,' given—it is said—by Magellan, the first European navigator who traversed its wide expanse, is doubtless appropriate to certain portions of this ocean; but, as a whole, it has no special claim to the epithet.

The greatest length of the P. O. from the Arctic (at Behring's Strait) to the Antarctic circles is 9,200 m., and its greatest breadth, along the parallel of latitude 5 n., about 10,300 m.; area approximately estimated 80,000,000 English sq. m., or about ⅖ of the whole surface of the globe. Its form is rhomboidal, with one corner incomplete (at the south), and its surface is studded with numberless islands, either scattered or in groups; these, however, are chiefly on the w. side. Along the whole e. side, is a belt of sea of varying width, which, with very few exceptions, is free from islands. The deepest sounding yet found (n. lat. 11° 24′, e. long. 143° 16′) is 26,850 ft., or more than 5 m.—nearly equal to the height of the highest mountain on the globe. The coasts present a general resemblance to those of the Atlantic, and the similarity in the outline of the w. coasts of each is striking, especially n. of the equator; but the shores of the P. O., unlike those of the Atlantic, are sinuous, and, excepting the n.e. coast of Asia, little indented with inlets. The shore on the American side is bold and rocky, while that of Asia varies much in character. Though the P. O. is by far the largest of the five great oceans, being about equal to the other four in extent, the proportion of land drained into it is comparatively insignificant. Its basin includes only the narrow strip of the American continent w. of the Andes and Rocky Mountains; Melanesia (except almost the whole of Australia), which contains few rivers, and none of large size; the Indo-Chinese states, China Proper, with the e. part of Mongolia, and Manchuria.

Winds.—The trade-winds of the Pacific have certain peculiarities, only lately discovered. In general, they preserve their peculiar characteristics only within certain limits; thus, the s.e. trades are found to blow steadily only between 92° and 140° w. long.; while the n.e. trades are similarly fluctuating, except between long. 115° and 214° w. Beyond these limits, their action is in whole or in part neutralized by the monsoons and other periodical winds peculiar to the tropical regions of the Pacific. In Polynesia, especially near the New Hebrides group, hurricanes are frequent from Nov. to Apr., but with few of the terrible characteristics which distinguish the hurricanes of the W. Indies and Indian Ocean. N. and s. of the tropical zone, the winds exhibit little periodicity, being found to blow from all parts of the compass at any given season of the year, though a general w. direction is most frequent. On the coast of Patagonia and at Cape Horn, w. winds prevail during the greater part of the year, while in the Sea of Okhotsk they are rare. The frightful Typhoon (q.v.) is the terror of mariners in the Chinese seas, and may occur at any season of the year. There are many other winds and storms, such as white squalls, cyclones, 'tempestades,' etc., confined to particular localities (see their special titles: also STORMS).

Currents.—The currents are less marked in character and effects than those of the Atlantic. The *Southern Pacific current* takes its rise s. of Van Diemen's Land, and flows e. at the rate of half a mile per hour, dividing into two branches about long. 98° w., the n. branch or *Current of Mentor* turning n., and gradually losing itself in the counter equatorial current; the s. branch continuing its e. course till it is subdivided by the opposition of Cape Horn into two branches, one of which, *the cold current of Peru* or *Humboldt's current*, advances n. along the w. coast of S. America, becoming finally absorbed in the equatorial current; the other washing the coast of Brazil, and becoming an Atlantic current. The P. O., like the Atlantic, possesses its equatorial current, separated into a n. and s. current by the equatorial counter-current. It sweeps across the whole ocean from e. to w. Two subdivisions of the s. current, called respectively the 'current of Rossel' and the 'warm current of Australia,' flow, one through the Polynesian archipelago to New Guinea, the other along the e. coast of Australia. The n. equatorial current, after reaching the coast of Asia, turns n.e., washing the shores of China and Japan, under the name of the *Black* or *Japan current;* it then sends off a branch along the coast of Kamtchatka, and advances e. till it becomes lost on the n.w. coast of N. America. There are minor currents, the most remarkable of which is that of Fleurieu, which describes a kind of irregular circle with a radius of about 240 m., in lat. 25°-40° n. and long. 133°-155° w. All these currents have their corresponding counter-currents.

There are two 'sargassos' or weedy seas of considerable extent in the P. O., one 15° e.s.e. of New Zealand; the other, and by far the larger, about 15° w. of San Francisco. There is also a large region nearly half-way between Cape Horn and New Zealand, which seems to correspond to the deserts on land, as mariners report it almost wholly destitute of any signs of life either in sea or in air.

History.—The existence of this ocean became known to Europeans first through Columbus, who had received accounts of it from some of the natives of America though it was seen first by Balboa, 1513, Sep. 29, and first traversed by Magellan eight years later; but its size, limits, and the number and position of its islands, etc., were little known till long afterward. Capt. Cook deserves the first place among the investigators of the P. O.; and after him come Anson, the two Bougainvilles, La Perouse, Carteret, Vancouver, Kruzenstern, Kotzebue, etc. The most thoroughly scientific examination of its physical condition is that accomplished by the *Challenger* Expedition 1873-76.

PACINIAN BODIES, *pă-sĭn'ĭ-ăn bŏd'ĭz*, or PACINIAN CORPUSCLES, n. plu. [after *Pacini*, Italian anatomist]: remarkable structures appended to the nerves. In the human subject, they are found in great numbers in connection with the nerves of the hand and foot, and sparingly on other spinal nerves, and on the plexuses of the sympathetic, but never on nerves of motion. They always present a *proximal end*, attached to the nerves by a stalk of fibrous tissue prolonged from the neurilemma, and occasionally one-tenth of an inch long; and a *distal end*, lying free in the connective or areolar tissue. In the human subject, the corpuscles vary in length from one-twentieth to one-tenth of an inch. They are usually seen very readily in the mesentery of the cat, appearing as pellucid oval grains, rather smaller than hemp-seed. The microscopic examination of these bodies discloses a very remarkable internal structure. They consist, first, of a series of membranous capsules, 30 to 60 or more in number, inclosed one within the other; secondly, of a single nervous fibre, of the tubular kind, inclosed in the stalk, and advancing to the central capsule, which it traverses from one end to end, and where it finally terminates in a divided swollen extremity. The 10 or 15 innermost capsules are in contact with one another, while the rest are separated by a clear space containing fluid, so abundant as to constitute far the largest portion of the bulk of the entire corpuscle. Such are the views of Pacini (given in his *Nuovi Organi Scoperte nel Corpo Umano*, 1840)—who is usually regarded as their discoverer, though they had been noticed and roughly described nearly a century before by Vater—of Henle, and of Todd and Bowman; but later observations made by Huxley, Leydig, Kölliker, and others, show that the question of their nature is still open. Huxley asserts that their central portion is solid, and not hollow; that, in birds, and in the human hand, there is no fluid between the laminæ—and indeed, that the laminæ themselves have no real existence—the Pacinian corpuscle being merely a solid mass of connective tissue (a thickened process of the neurilemma of the nerve to which it is attached), whose *apparent lamination* depends on the regular disposition of its elastic elements. See Quain's *Anatomy*.

PACK, n. *păk* [Dut. *pak;* Icel. *pakki;* Sw. *packa;* Ger. *pack*, a pack, a bundle: Ir. *pac* and *pacadh*, a pack: comp. L. *pango*, I fasten or make fast; *pactus*, fastened or made fast: Esthon. *pakima;* Fin. *pakkata*, to stuff, to cram]: a bundle or bale tied up for convenient carriage; a load; a set of playing-cards; a great number or quantity; a body of hounds for hunting; a number of persons confederated, in an ill sense; a weight of wool 240 lbs.: V. to bind together tightly and firmly; to place in close order; to select and put together persons for an unjust object, as, to *pack* a jury; to put together necessaries for a journey; to tie up goods for carriage; to go or send off in a hurry. PACK′ING, imp. binding in a bundle; pressing together in a box or barrel, as herrings: N. the act of binding together in a bundle; material used in making water or air tight; in *OE.*, tricks; falsehoods. PACKED, pp. *păkt:* ADJ. bound or pressed together; sent off; selected and put together for a particular purpose, usually in a bad sense. PACK′ER, n. *-ėr*, one who packs goods. PACK′AGE, n. *-āj*, a bundle or bale of goods. PACK′ET, n. *-ĕt* [OF. *pacquet*, a packet—from mid. L. *paccus*, a bundle]: a small pack; a small parcel as of loose papers or letters; a vessel regularly sailing between two or more ports for the conveyance of letters, passengers, and light goods; also called a PACKET-BOAT or PACKET-SHIP. PACK-CLOTH, cloth for packing. PACKHORSE (see below). PACK-HORSEMAN, pedler carrying a pack on horseback. PACK-ICE, in the *polar regions*, an assemblage of large pieces of floating ice. PACKING-CASE, a deal or other box for protecting heavy goods in transport. PACK-LOAD, the average load an animal can carry on its back. PACKMAN, one who carries a load of articles on sale from place to place; a pedler. PACK-SADDLE, a saddle suited for carrying loads on. PACKSHEET, a strong, coarse material for packing goods in; a large cover for goods in a wagon. PACK-THREAD, strong thread or twine for making up packs.

PACKARD, *păk′ėrd*, ALPHEUS SPRING, Jr., M.D.: naturalist: b. Brunswick, Me., 1839, Feb. 19; son of Alpheus Spring P., D.D. (1799–84), who was for 65 years prof. in Bowdoin College. The son was graduated at Bowdoin 1861, and at the Maine Medical School 1864, having in the mean time served as a volunteer assistant in the geol. survey of Maine, and studied nat. history at Cambridge under Louis Agassiz. He served one year in the army as asst. surgeon. He was associated 1865 with A. Hyatt, E. S. Morse, and F. W. Putnam, in establishing the Peabody Acad. of Science in Salem, Mass., and was for some time director of its museum. In the winter of 1869–70 he made zoological collections on the Florida reefs, and 1871–73 was state entomologist of Mass.; 1875–77 he was attached to the U. S. geol. survey. Since 1878 he has held the chair of geology and zoology in Brown Univ. His published works number more than 400, and he is the author of a new classification of insects (1863) which has been generally adopted both in America and in Europe.

PACKER, *păk'ėr*, ASA: 1805, Dec. 29—1879, May 17; b. Groton, Conn. At the age of 17, seeking employment, he walked to Susquehanna co., Penn., obtained an interest in Lehigh valley canal boats, became a storekeeper 1831, and a few years later a contractor and boat-builder, and engaged in mining. He was a member of the Penn. legislature 1844, county judge 5 years, planned and carried to completion the Lehigh Valley railroad, which opened the coal region and made him the wealthiest man in the state. He served two terms in congress 1853–57, was an unsuccessful candidate for gov. of Penn. 1869, and was one of the commissioners of the Centennial Exhibition at Philadelphia 1876. He founded Lehigh Univ., at South Bethlehem, Penn., 1865, giving 115 acres of land and $500,000; and at his death left $1,000,000 to increase its endowment. He died in Philadelphia.

PACKER COLLEGIATE INSTITUTE: in Brooklyn; established as the Brooklyn Female Acad. 1845; destroyed by fire 1852; rebuilt through the generosity of Mrs. William F. Packer; rechartered under its present name 1853; and opened 1854. It has primary, preparatory, academic, and collegiate departments, and a course, comprising all, of 12 years, the collegiate course being 6 years. It is supported wholly by tuition fees, is governed by a board of 15 trustees, and its graduates are admitted to colleges as senior students. 1890, Oct. 1 it had 48 professors and instructors, 720 students, scientific apparatus valued at $12,000, ground $72,500, building $142,259, 32 scholarships valued at $1,500 each, and 5,300 vols. in its library. Truman J. Backus, LL.D., was pres., and A. A. Low pres. of the board of trustees. The Institute had graduated 1,076 young ladies since its opening, 30 of them 1890. The building contains a Gothic chapel with sittings for 800 persons; gymnasium 100 x 26 x 16 ft., equipped by the alumnæ; physical and chemical laboratories; well-lighted library; and 30 study and recitation rooms. Its sanitary appointments are excellent, and its general furnishing is suggestive of comfortable and refined home life.

PACKFONG, n. *păk'fŏng*, or PETONG: in China, a white alloy of arsenic and copper; formed by putting two parts of arsenic in a crucible with five parts of copper turnings, or finely divided copper; the arsenic and copper require to be placed in alternate layers, and the whole is covered with a layer of common salt, and pressed down. When melted, the alloy contains nearly the whole of the arsenic, and is yellowish-white in color when in the rough state, but takes a fine white polish resembling silver. It is not very ductile, and cannot be fused without decomposition, as the arsenic is easily dissipated. It was formerly much used in Europe, as well as China and India, for making the pans of small scales, dial-plates, and a variety of other articles requiring nicety. In China it is still extensively employed.

PACK'HORSE: horse employed in the carriage of goods, which are either fastened on its back in bundles, or, if weighty, are placed in panniers, slung one on each side across the horse's back. This mode of conveying goods was formerly very common. The saddle to which the bundles were fastened consisted of two pieces of wood, curved to fit the horse's back, and joined together at the ends by other two straight pieces. This frame was well padded underneath, to prevent injury to the horse's back, and was firmly fastened by a girth. To each side of the saddle, a strong hook was attached, for carrying packages, panniers, etc. Panniers were sometimes simply slung across the horse's back with a pad under the band. The panniers were wicker baskets, of various shapes according to the nature of their usual contents, being sometimes long and narrow, but usually having a length of three ft. or more, a depth of about two-thirds the length, and a width of one to two ft. In the mountainous regions of Spain, Austria, and some other countries, this is still almost the only mode of transport; though the mule has, especially in Europe, been substituted for the horse.

Packhorse and Panniers.

An army requires to be accompanied by several thousand pack-animals, sometimes horses, but preferably mules; and in Asia, usually camels, or elephants.

PACKWAX, n. *păk'wăks* [OE. *fax;* AS. *feax*, hair, and AS. *weaxan*, to grow]: a large tendon of a yellowish color in the neck of animals—also spelled PAXWAX.

PACO, n. *pā'kō*, or PACOS, n. *pā'kōz* [Peruvian, *paco*]: the alpaca; the Peruvian name for an earthy-brown oxide of iron, containing minute particles of native silver.

PACOURY-UVA, *pă-kow'rĭ-ū-vâ:* sweet and delicious Brazilian fruit, a large berry produced by the *Platonia insignis*, tree of nat. order *Clusiaceæ.* The seeds have the taste of almonds.

PACT, n. *păkt*, or **PACTION**, n. *păk'shŭn* [F. *pacte*, a pact—from L. *pactum*, an agreement—from *paciscor*, I agree, I stipulate]: a contract; an agreement. **PAC'TIONAL**, a. *-ăl*, by way of agreement. **PACTUM ILLICITUM**, in the law of Scotland, a contract or agreement for some illegal purpose, i.e., a purpose either expressly prohibited by statute, or by the general policy of the law; an 'illegal contract,' as it is termed in other systems of law. Thus a contract between a client and agent, called a *pactum de quota litis*, whereby a share of the property which is the subject of litigation is given to the agent instead of his usual fees, is void in most cases; though it is often difficult to determine what contracts fall within this rule. The courts, however, construe very jealously every contract which tends to corrupt the administration of the law. So agreements by a client to give an excessive sum to his law-agent as a gift have been often set aside.

PACTOLUS, *păk-tō'lŭs:* anciently the name of a small brook of Lydia, in Asia Minor, rising on the n. slope of Mount Tmolus (modern *Buz Dagh*), flowing n. past Sardis (*Sart*), and emptying into the Hermus (*Kodus*). It is nowhere more than ten ft. broad, and one ft. deep. The sands or mud of P. were long famous in antiquity for the particles of gold dust which they contained, supposed to have been carried down by its waters from Tmolus—a hill rich in metals. The collection of these particles, according to legend, was the source of Crœsus's vast wealth. But as early even as the time of Strabo, P. had ceased to yield any of the precious dust. The brook is now called *Sarabat.*

PAD, n. *păd* [Dut. *pad*, a path: Low Ger. *pad*, the sole of the foot; *pedden*, to tread: Fin. *padet*, a footpath: connected with L. *pedis*, of a foot]: a robber who infests a road on foot, usually in the form *footpad;* an easy-paced horse: V. to travel slowly; to rob on foot. **PAD'DING**, imp. **PAD'DED**, pp.

PAD, n. *păd* [Fin. *padja*, a long sort of pillow: Dut. *pakje*, a packet: Sp. *paja*, straw, chaff: Swiss, *bätsch*, a lump: connected with *pod*]: a separate mass or pack, as of wool; a bunch, as of skeins of yarn; a flat cushion; a soft saddle; a thick mass of sheets of blotting-paper for writing on: V. to stuff with padding; to impregnate cloth with a mordant. **PAD'DING**, imp.: N. the material used for stuffing; the stuffing of a coat, saddle, and the like; the act of imbuing with a mordant. **PAD'DED**, pp.: ADJ. stuffed with a soft substance.

PADANG, *pâ-dâng':* capital of the Dutch govt. of the w. coast of Sumatra, 0° 59′ 30″ s. lat., and 100° 20′ 30″ e. long. The Padang flows through the town, but is navigable for only small vessels, the larger anchoring in the roadstead, about three m. distant. On the left bank, stand the houses of the natives, unsightly bamboo erections, elevated about eight ft. from the ground by posts of the cocoa-nut tree, and covered with leaves. The govt. buildings, houses of the Europeans and Chinese, etc., are on the right, and mostly of wood or stone, roofed with tile. P. is picturesquely inclosed by a semicircle of mountains, behind which rises a loftier chain, two being volcanoes. There are a Prot. church, Rom. Cath. church, flourishing schools, fort, military hospital, govt. workshops, large warehouses, etc. An agent of the Netherlands Trading Company (q.v.) resides at P., which is the centre of the exports and imports of Sumatra's w. coast, and has a lively trade with Java, the other islands of the E. Archipelago, and Europe, and with the interior of the island.

The climate is considered healthful, though the heat is great. Col. Nahuys found the thermometer range from 70° to 80° at 6 A.M., from 82° to 88° at noon, 84° to 90° at 2 P.M., 78° to 84° at 6 P.M., and 72° to 80° at 10 P.M.

The gov. resides at a country-house about two and a half m. above P., and rules a territory stretching from the s.e. corner of the island. It comprises the greater part of Sumatra, and is divided into the residencies of Lower P., Upper P., Tapanoeli (Tapanuli), Bencoolen, the Lampongs, and Palembang.

Lower Padang was the first dist. of the w. coast of Sumatra which submitted to the Dutch, who had formed a settlement at P. as early as 1660, and by repeated wars, gradually extended their territory.

Upper Padang is n.w. of the lower province, from which it is separated by a chain of lofty mountains, some of which, as the Singalang, Merapie, and Sago, are nearly 10,000 ft. in height; Merapie being an active volcano, the last eruptions of which were in 1845–55, though it sent forth volumes of smoke 1861. This residency possesses the most lovely districts of the island, or of any tropic land, the mountain slopes being studded with villages, rice-fields, cocoa-nut and coffee trees, of which last, it is calculated that there are 32,000,000 in Upper P. In addition to coffee, there is a large production of gambier, cassia, pepper, ratans, indigo, caoutchouc, etc.; and gold, iron, copper, lead, and quicksilver are found. In the dist. of Tanah Datar is the town of Paggeroejong, former cap. of the powerful kingdom of Menangkabo, and the residence of the king.

Tapanoeli, the remaining residency under the govt. of Sumatra's w. coast, is n.w. of Upper P. The independent spirit of the inland natives has caused the Netherlanders much trouble, but each fresh outbreak only extends their territory and power further into the interior, and toward the n.w. of the island.

Pop. of the city of P. about 12,000; total pop. of Dutch possessions about 2,000,000, besides 3,000 Chinese and 2,000 Europeans. This is irrespective of Achin (q.v.).

PADDLE, v. *păd'l* [F. *patrouiller;* OF. *patouiller*, to paddle or dabble with the feet: It. *pattuglia;* Bav. *patschen*, to tramp: Low Ger. *patsch*, mud; *pladern*, to paddle: comp. F. *patte*, the foot]: to play in the water with the hands and feet; to beat the water, as with oars; to propel by an oar or paddle: N. a short oar with broad blades, used in propelling light boats and canoes; probably the precursor of the OAR (q.v.), and still its substitute among barbarous nations, and the appropriate implement for the Canoe (q.v.). It is of wood, consisting of a wide, flat blade with a short handle, by means of which the operator spoons the water toward him. In canoes for only one sitter, a double paddle is frequently used, which is dipped alternately on either side: the inhabitants of Greenland are especially skilful in this operation. The action of the paddle is the same as that of the oar, though less forcible. The paddle has, however, the advantage that the rower faces the bow of his boat, and sees what is before him—an appreciable gain in threading narrow streams. **PAD'DLES**, n. plu. *-lz*, the broad boards at the circumference of a water-wheel. **PAD'DLING**, imp. *-ling*. **PAD'DLED**, pp. *-ld*. **PAD'DLER**, n. *-lėr*, one who paddles. **PADDLE-BOARDS**, flat boards for catching the water, placed around a water-wheel. **PADDLE-BOX**, the structure confining the paddle-wheel of a steamboat. **PADDLE-FISH**, *Polyodon folium*, fish found in the Mississippi river and its affluents; about 5 ft. in length, with a bony snout about as long as the body, which it uses as a paddle to dig from the mud the animals that are its food. It has no scales, and is dark blue on the back and whitish on the belly. **PADDLE-STAFF**, a little spade used to clear the plowshare: see *Note* 2. **PADDLE-WHEEL STEAMER**, steamer propelled by paddle-wheels.

Paddle.

Double Paddle.

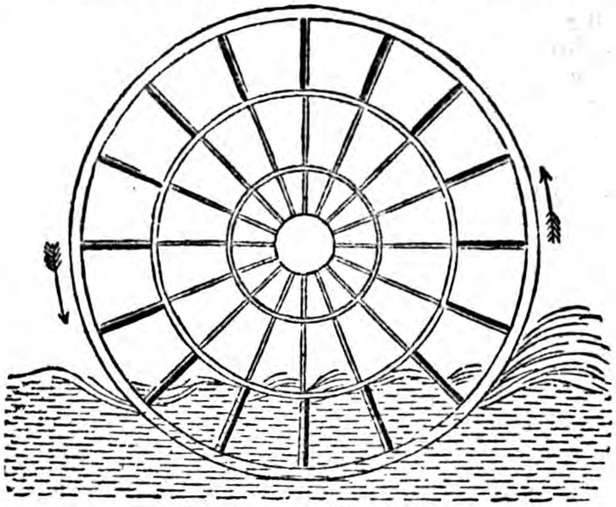
Note 1.—PADDLE is a frequentative of *pat*, and thus signifies 'to pat often; to keep handling.' So we have Ger. *padden* and *paddeln*, to patter about, to walk with short steps.

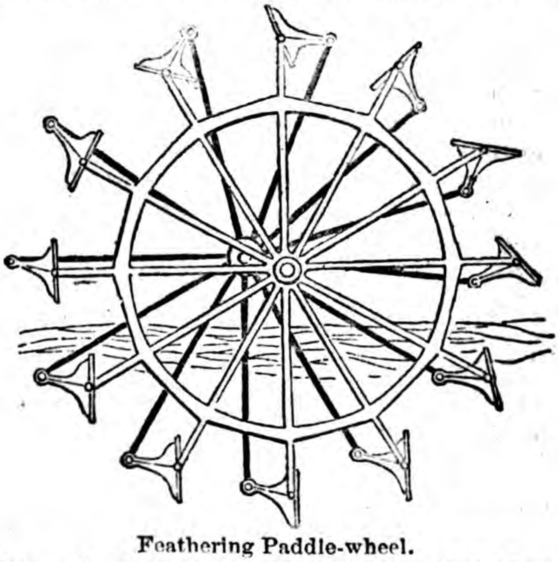
Note 2.—PADDLE in OE. is used for SPADDLE, in the sense of a 'little spade or broad blade.'

PAD'DLE-WHEEL: one of the appliances in steam-vessels by which the power of the engine is made to act on the water and produce locomotion. It is a skeleton wheel of iron, on the outer portion of whose radii flat boards, called floats or paddles, are fixed, which beat rapidly against the water, and produce continuously the same effect as is given in an intermittent manner by the blades of oars. The use of the P.-W. in conjunction with steam as a motive-power dates from about the commencement of the 19th c., but the employment of the P.-W. itself is ancient as the time of the Pharaohs. A specimen is known also to have been tried in the 16th c. in Spain.

PADDLE-WHEEL.

In the ordinary form of paddle-wheel, that called the radial, the floats are *fixed*. Thus a certain loss of power is involved, as the full force of the engine on the water is experienced only when the float is vertical, and as on entering and leaving the water the power is employed mainly in depressing or lifting the particles of water. This objection has great force at the moment of starting, or when progress is very slow, as is illustrated by the small power that a paddle-steamer evinces when trying to tug a stranded vessel off a sandbank; but when in full progress, the action is less impeded by the disadvantage referred to, the water in front of the wheel being depressed, and that abaft being thrown into the form of a wave. The extent of the immersion much influences the economy of power, as will be readily understood if the consequences of immersion up to the centre of the wheel be imagined. An immersion somewhat over the top of


Ordinary Paddle-wheel.


Feathering Paddle-wheel.

the lowest float is the most advantageous, and in order that the floats may be as nearly as possible vertical when they strike the water, it is advisable to give the wheel as large a diameter as possible, and to place the axis at the highest available point in the vessel.

To overcome the drawbacks to the radial wheel, Elijah Galloway patented, 1829, the *Feathering Paddle-wheel*, in which the floats are mounted on axes, and are connected by rods with a common centre, which revolves upon a pin placed eccentrically to the axis of the paddle-wheel. By this method, the floats are kept, while immersed, at right angles to the surface of the water. So long as the water is smooth the gain is great, consequently feathered floats are much used in river-steamers; but for ocean-steamers the liability to derangement, perhaps at a critical period, is a great objection to their use.

The paddle-wheel, in revolving, imparts both a forward velocity to the vessel and a backward velocity to the water. The latter is called the *slip*, and sometimes bears a very large and wasteful proportion to the former. The absolute velocity of the paddle floats is equal to the sum of the slip and the forward motion of the ship, so that the wheel always revolves faster than the ship makes way.

In recent years the P.-W. has been very largely supplanted by the Screw-propeller (q.v.).

PADDOCK, n. *păd'ŏk* [AS. *pearroc*, an inclosure: OE. *parrock*, a little park—from *sparran*, to inclose, with dim. suffix *-ock*—see Skeat. Perhaps dim. of *pad*, a piece or patch: Swab. *pfatt*, an inclosure]: a small inclosed park adjoining a stable or mansion: see PARK.

PADDOCK, n. *păd'ŏk* [Icel. *padda;* Dut. *padde;* It. *botta*, a toad]: a frog; a toad. PADDOCK-STOOL, a mushroom or other fungus.

PADDY, n. *păd'dĭ* [a dim. of *Patrick*]: a familiar name for an Irishman.

PADDY, or PADI, n. *păd'dĭ* [Tamil and Malay name]: in *E. Indies*, rice in the husk. PADDY-FIELD, a field under rice cultivation: see RICE.

PADELION, n. *păd'ĕ-lī'ŏn* [F. *pas de lion*, foot of the lion]: a plant called lion's-foot; lady's-mantle; the *Alchĕmil'la vulgāris*, ord. *Rosācĕæ*.

PADELLE, n. *pă-dĕl'*, or PADELLA, n. *pă-dĕl'lă* [It. *padella;* OF. *padelin*, a frying-pan, a vessel for melting glass in: L. *patella*, a small pan or dish]: a large shallow metal or earthen cup or deep saucer containing fatty matter and a short thick wick, used in illuminations. PADELLES', n. plu. *-dĕlz'*, or PADEL'LAS, n. plu. *-lăz*. The illumination of St. Peter's at Rome, and other large buildings in Italy, is effected by the tasteful arrangement of large numbers of these little pans, converted into lamps by partly filling them with tallow or other grease, and placing a wick in the centre.

PADERBORN, *pâ'dėr-bōrn:* chief town of a dist. in the Prussian province of Westphalia, 60 m. s.w. of Hanover; 51° 43′ n. lat., and 8° 45′ e. long.; in a pleasant and fruitful region, at the source of the Pader, which bursts forth below the cathedral with sufficient force to drive mills within 20 paces of its source. P. has narrow, dark, old-fashioned streets, presenting no special attractions, though it has some interesting buildings, e.g., the fine old cathedral, completed 1143, with its two magnificent façades, and containing the silver coffin in which are the remains of St. Liborius. P. is the seat of a bp. and chapter, and of an administrative court. The manufactures, not very considerable, include tobacco, starch, hats, and wax-cloths, and there are several breweries, distilleries, and sugar-refineries, and trade in cattle, corn, and oils. The town is one of the important stations on the Great Westphalia railway.—P., which ranked till 1803 as a free imperial bishopric, owes its foundation to Charlemagne, who nominated the first bp. 795. Several diets were held during the middle ages at P., then one of the most flourishing of the Hanseatic Cities, while it was numbered also among the Free Imperial Cities. In 1604, it was forcibly deprived by the prince-bishop, Theodor of Fürstenburg, of many of the special rights and prerogatives which had pertained to it since its foundation, and compelled to acknowledge the Rom. Cath. as the predominant church, in the place of Protestantism, which had been established during the time of Luther. In 1803 P. was attached as an hereditary principality to Prussia, and after being incorporated in the kingdom of Westphalia, was restored to Prussia 1813, and incorporated in the Westphalian circle of Minden.—Pop. (1880) 14,689, of which 12,602 Rom. Catholic.

PADIHAM, *păd'ĭ-ham:* large chapelry and township, in the higher division of the hundred of Blackburn, England; on an eminence on the n. bank of the Calder, and reached by the Rose Grove station of the Lancashire and Yorkshire railway, also by the Leeds and Liverpool canal. It is about 9 m. n.e. of Blackburn. The cotton trade employs a great proportion of the population; but coal-mines and extensive quarries add to industrial activity, and prosperity. Pop., with Hapton (1881) 8,983.

PADILLA, *pâ-thēl'yâ,* JUAN LOPEZ DE: one of the most popular heroes in Spanish history; b. toward the close of the 15th c.; d. 1521, Apr. 24; scion of a Toledan family. He was appointed by Emperor Charles V. military commandant of Saragossa. A formidable rebellion, caused by the excessive taxes which the emperor imposed on the Spaniards, to defray the cost of his various wars in Italy, Germany, and the Low Countries, broke out among the towns (*Communidades*) of Castile, and the rebels, known as *communeros*, called P. to put himself at their head. The introduction of the religious element into the quarrel tended greatly to strengthen the insurgents, and for a moment P. was the ruler of Spain, and formed a new junta to carry on the government. He was successful in a number of enterprises against the royalist party; but 1521, Apr. 23, was defeated by the royalists at Villalos, in a conflict which decided the fate of the rebellion. P. was taken prisoner, and next day beheaded.

His wife, DONA MARIA DE PACHECO, rallied the wrecks of the rebel army, and for a long time held Toledo against the royalist besieging force, and, after the capture of the city, retired to Portugal, where she soon died. With P. and his wife passed away the last remnant of the ancient freedom of Spain. Numerous poems and dramas celebrate their deeds.

PADISHA, n. *pâ-dē′shâ* [Pers. *Padishah*, Turk. *Padishag*—from *pad*, protector; *shah*, king]: Great King, Emperor; one of the titles of the sultan of Turkey, and of the shah or sovereign of Persia. Formerly, this title was accorded only to the kings of France among European monarchs, the others being called *Kral*, king. It was subsequently allowed to the emperor of Austria, and later, by a special article in the treaty of Kutshuk-Kainardji (1775), to the autocrat of All the Russias. Of late it has been accorded to the monarchs of all the great European nations, and even to those of secondary states.

PADLOCK, n. *păd′lŏk* [from Eng. *pad*, in the sense of a lump, and *lock:* perhaps connected with mid. L. *pedānă*, a clog, a chain to tether the foot of an animal]: a lock hanging like a clog to an animal's foot; a hanging or portable lock, with a link, for putting through an eye or a staple: V. to shut; to confine. PAD′LOCKING, imp. PAD′LOCKED, pp. *-lŏkt*.

PADRON, *pâ-drōn′:* a very ancient town of Spain, province of Coruña, 15 m. s.w. of Santiago, on the Sar, a few m. from the coast. P., being the place at which the body of Santiago is said to have landed itself, was formerly an important place of pilgrimage. Pop. (1877) 8,424.

PADRONE, n. *pa-drō′nā* [It. a master, a patron]: a man, usually an Italian, who owns street-organs, and lets them out for hire—sometimes hiring players to operate them for a small fraction of the daily receipts, and exercising over them an almost despotic authority.

PADUA, *păd′ū-a* (It. *Padova*): ancient and picturesque city in n. Italy, on a beautiful plain on the Bacchiglione, 23 m. by railway w.s.w. of Venice, 18 m. s.e. of Vicenza. It is surrounded by walls and ditches, and fortified by bastions. Its houses are lofty, supported mostly on long rows of arches, generally pointed; and most of its streets, especially in the older quarters, are narrow, dark, dirty, and ill-paved. There are several handsome gates, as those of San Giovanni, Savonarolo, and Falconetto; a number of fine squares, of which the

Prato della Valle is largest and finest, and is surrounded by a stream; and several magnificent buildings. The Café Pedrocchi is esteemed the finest edifice of the kind in Italy. Portions of a Roman edifice were discovered while the foundations of this building were being made, and the marbles found now adorn the pavement, etc., of the *salone*. The Palazzo della Ragione, built 1172–1219, is the most peculiar and most national in the city. It is an immense building, forming one side of the market-place, rests wholly on arches, and is surrounded by a Loggia (q.v.). Its e. end is covered with shields and armorial bearings, and its roof is said to be the largest unsupported by pillars in the world. Its great rectangular hall is 267½ ft. long, 89 ft. wide, and 78 ft. high; is covered with mystical and metaphorical paintings, and contains a monument of Livy, the Roman historian, and a bust of Belzoni, the traveller, both natives of this city. The other chief edifices are the cathedral; the church of Sant' Antonio, a beautiful building in the Pointed style, with several Byzantine features, and remarkably rich and splendid in internal decorations; and the churches of San Giorgio and of Santa Giustina—all richly decorated with paintings, sculptures, etc. The Univ. of P., the most famous establishment in the city, was famous as early as 1221. It has 61 professors and other teachers, and is attended by about 1,000 students. Connected with the univ. are an anatomical theatre and a botanic garden, both dating from the 16th c., and each the first of its kind in Europe. There is also a museum of nat. history, an observatory, a chem. laboratory, and a library of 120,000 vols. and 1,500 MSS. There are also numerous palaces, theatres, and hospitals. Pop. (1881) 70,753.

P., the Roman *Patavium*, according to a widespread belief of antiquity, alluded to by Virgil, was founded by the Trojan chief Antenor; but really nothing is known of its history until it became a Roman town. During the first centuries of the empire, it was the most flourishing city in n. Italy, on account of its great woolen manufactures, and could return to the census more persons wealthy enough to be ranked as *equites* than any other place except Rome. But in 452 Attila utterly razed it to the ground. It was rebuilt by Narses, again destroyed by the Lombards, but once more rose from its ashes, and became a very famous city in the middle ages. It fell into the hands of the Carrara family 1318; and 1405 was conquered by Venice, whose fortunes it has since shared.

PADUCAH, *pa-dū'ka:* city, cap. of McCracken co., Ky.; on the Newport News and Mississippi Valley and the St. Louis Alton and Terre Haute railroads, and on the Ohio river; about 225 m. from Louisville, and nearly the same distance from Memphis, Tenn. At this point the Tennessee river empties into the Ohio, furnishing water communication with many important points. There are 17 churches; a girls' seminary; a high school and excellent graded schools; 2 hospitals; 2 daily, 1 semi-weekly, and 2 weekly newspapers; 3 national and 2 state banks (cap. $655,000). There are several lumber-mills, 2 foundries, railroad repair-shops, and manufactures of flour, ice, tobacco, brooms, harness, carriages, and other articles. An abundant supply of water is obtained from the Tennessee river; the city is lighted with gas, and has an organized fire dept. P. is a shipping point for the products of a rich and extensive agricultural region, with which it has a large wholesale and retail trade. The first white settlement was made 1821; the town was regularly laid out 6 years later, was incorporated as a town 1830, and became an incorporated city 1856. Pop. (1870) 6,866; (1880) 8,036; (1890, census, first report) 13,024.

PADULA, *pâ-dô'lâ:* town of s. Italy, province of Salerno, 52 m. s.e. of the town of Salerno, in a mountainous district. Below P. are the ruins of the once famous and magnificent monastery, *La Certosa di S. Lorenzo*, despoiled by the French during their occupation of Calabria.—Pop. 8,000.

PA'DUS: see Po.

PÆAN, n. *pē'ăn* [L. *pæan*—from Gr. *paian*, a hymn in honor of Apollo]: name given by the ancient Greeks to a kind of lyric poetry originally connected with the worship of Apollo. The oldest pæans, as we learn from Homer, appear to have been either hymns addressed to that deity, to appease his wrath (*Iliad*, i. 473), or thanksgiving odes sung after danger was over and glory won (*Iliad*, xxiii. 391). At a later period, they were addressed to other deities also; thus, according to Xenophon, the Lacedæmonians sang a pæan to Poseidon after an earthquake, and the Greek army in Asia one to Zeus. In modern usage, P. is a song of triumph. PÆON, n. *pē'ŏn*, in *anc. poetry*, a foot of four syllables.

PÆDOBAP'TISM: see PEDOBAPTISM: BAPTISM, INFANT.

PÆ'ONY: obsolete form of PEONY (q.v.).

PÆSTUM, *pĕs'tŭm:* anciently a Greek city of Lucania, in s. Italy, in the present province of Salerno, on the *Sinus Pæstanus*, now the Gulf of Salerno, and not far from Mt. Alburnus. It was founded by the Trœzenians and the Sybarites, between B.C. 650 and 610, and was originally called Poseidonia (of which *Pæstum* is believed to be a Latin corruption), in honor of Poseidon (Neptune). It was subdued by the Samnites of Lucania, and slowly declined in prosperity after it fell into the hands of the Romans, who established a colony here about B.C. 273. The Latin poets celebrate the beauty and fragrance of its flowers, particularly its roses, which bloomed twice a year. Wild roses, it is said, still grow among its ruins, which retain their ancient property, and flower regularly in May and Nov. P. was burned by the Saracens in the 10th c., and there is now only a small village called Pesto, in a marshy, unhealthful, and desolate district; but the ancient greatness of the city is indicated by the ruins of temples and other buildings. These appear to have been noticed first in the early part of the 18th c., by Count Gazola, in the service of the king of Naples; they were described next by Antonini, in a work on the topography of Lucania (1745), and have since been visited by travellers from all parts of Europe.

PAEZ, *pâ-ĕth′*, JOSÉ ANTONIO: 1790, June 13—1873, May 6; b. Venezuela. He was of Indian descent, joined the patriot army 1810, and with a small force, which he had collected, won several battles and became commander of the revolutionists. He won the independence of Colombia at the battle of Carabobo 1821, represented Venezuela in the new govt., secured the independence of Venezuela 1829, was its first pres., was re-elected 1839, and superseded 1846. He was exiled 1850 for heading a revolution, resided in New York till 1858, when he was invited to return to Venezuela; was minister to the United States 1860–1, dictator of Venezuela 1861–2, but failed to restore peace. He spent several years in the Argentine republic and Peru, and again came to the United States 1872. He published an autobiography, and his *Life* has been published by his son. He died in New York.

PAGAN, n. *pā′găn* [L. *pagānus*, a countryman, the villages having continued heathen after the cities, with more education and mental activity, had become Christian—from *pāgus*, a village: F. *paysan*, a peasant; *païen*, a pagan: It. *pagano*]: one who is not a Christian, a Jew, or a Mohammedan; a heathen; an idolater: ADJ. heathenish. PA′GANISH, a. *-ĭsh*, pertaining to pagans; heathenish. PA′GANIZE, v. *-īz*, to turn or convert to heathenism. PA′GANIZING, imp. PA′GANIZED, pp. *-īzd*. PA′GANISM, n. *-ĭzm*, the worship of the whole human race except those portions which have embraced Christianity, Judaism, and Mohammedanism: heathenism; polytheism; idolatry; worship of gods that are no gods.

PAGANI, *pâ-gâ′nē:* uninteresting town of s. Italy, province of Salerno. In the church of St. Michele is the tomb of Alfonso de' Liguori, founder of the order of the Redemptionists, who died here 1787. The body is preserved in a glass case.—Pop. about 12,000.

PAGANINI, *pâ-gâ-nē′nē*, NICOLO: famous violinist: 1784, Feb. 18—1840, May 27; b. Genoa; son of a commission-broker. His musical talent showed itself in his childhood; in his ninth year, he had instructions from Costa at Genoa, afterward from Rolla at Parma, and from Ghiretti. In 1801 he began his professional tours in Italy; 1828 he created a great sensation on appearing for the first time in the principal towns of Germany; and 1831 his violin-playing created equal *furor* in Paris and London. His appearance in London was preceded by absurdly romantic stories of his imprisonment for 20 years in a dungeon, where he had learned to play on an old broken violin with only one string; and as a result, he could not walk the streets because of the crowd that gathered round him. P. amassed great wealth, though he was addicted to financial speculation and was generous in his gifts. His mastery over the violin has never been equalled in impressiveness and passionate power, moving his audiences at times to tears; but he was too much addicted to using his mastery in mere feats of musical legerdemain, such as his celebrated performance on a single string. His execution on the guitar also was very remarkable; for four years he made that instrument his constant study. P. died at Nice, of laryngeal phthisis, leaving a large estate.

PAGE, n. *pāj* [F. *page*—from L. *pāgĭna*, the page or leaf of a book—from *pango*, I fasten: It. *pagina*]: one side of the leaf of a book. PAGES, n. plu. *pā'jĕz*, a book or writing: V. to mark or number in pages. PAG'ING, imp.: N. the making up into pages; the marking or numbering the pages of a book. PAGED, pp. *pājd*.

PAGE, n. *pāj* [F. *page;* Dut. *pagie;* It. *paggio*, a serving-boy: Gr. *paida*, a child: Gael. *paisde*, a little boy or girl]: a boy (usually, though not necessarily) who attends on a great person, but who is not a menial; also, one who attends on a person of rank or affluence, and who is a menial. The practice of employing youths of noble birth, in personal attendance on the sovereign, existed in early times among the Persians, and was revived in the middle ages under feudal and chivalric usages. The young nobleman passed in courts and castles through the degree of page, preparatory to being admitted to the further degrees of esquire and knight. The practice of educating the higher nobility as pages at court began to decline after the 15th c., till pages became what they are now, mere relics of feudal usages. Four pages of honor, personal attendants of the sovereign, form part of the state of the British court. They receive a salary of £200 a year each, and, on attaining suitable age, receive from the sovereign a commission in the foot guards.—In legislative bodies in the United States, pages are boys or young men who attend on the officials of the body, or on the members—often developing such readiness and knowledge of usage in details of business as make them very serviceable in various ways. PAGE, v. in *OE.*, to attend as a page. *Note.—Pages* in olden times were not particularly young; the derivation may therefore be from mid. L. *pagĭŭm*, a servant; *pagensis*, peasant, rustic—and so from L. *pāgus*, a village: Prov. *pages*, a peasant: Port. *pagem*, a servant—see Littré and Skeat.

PAGE, HARLAN: 1791, July 28—1834, Sep. 23; b. Coventry, Conn. In 1825 he was appointed agent of the American Tract Society, at its headquarters in New York, and held this position till his death. He was noted for his piety and philanthropy, and for the skill and zeal of his personal effort with individuals, to lead them into the light of a Christian faith. See *Memoir* by the Rev. William A. Hallock (Amer. Tract Soc. 1835).

PAGE, JOHN, *pāj:* 1744, Apr. 17—1808, Oct. 11; b. Rosewell, Gloucester co., Va.; colonial patriot and statesman; grandson of Mann P., next to Lord Fairfax the largest landholder in Va. He graduated at William and Mary Coll. 1763, was representative in the Va. house of burgesses, member of the colonial council, and, 1776, delegate to the convention which framed the Va. state constitution. During the revolution, he rendered important services as one of the committee of public safety and lieut.gov. of the commonwealth, contributing largely to the cause from his private fortune. He represented Va. in the national congress 1789, Mar. 4—1797, Mar. 3. In 1800 he was presidential elector, and 1802 was chosen gov. of Va., in which capacity he served three years. He was distinguished for theological learning as well as for soldierly qualities. He died at Richmond.

PAGE, WILLIAM: Amer. artist: 1811, Jan. 23—1885, Oct.; b. Albany. At 9 years of age, he received a premium for a drawing at the Amer. Institute; at 15, he was pupil of Prof. Morse and at the National Acad., where he won a medal. For two years he studied theology at Amherst and Andover; but resumed art, painting portraits. While in Europe, 1849–60, he made excellent copies of Titian, and painted classical and scriptural pieces. He was pres. of the National Acad. 1871–73. Besides portraits of many eminent persons, his works include a Venus, an infant Bacchus, a Cupid, a Holy Family, *Moses and Aaron on Mount Horeb*, *Flight into Egypt*, *Ruth and Naomi*, and *Admiral Farragut at the Battle of Mobile Bay*—the last presented by purchase to the emperor of Russia. His ideal head of Christ, 1870, attracted much attention. From the study of a reputed death-mask of Shakespeare, he made, 1874–78, a bust and several portraits of the poet. He has been regarded as a remarkable colorist in the manner of Titian, whose secret he thought that he had discovered, and otherwise as an artist of rare merit. His versatility led him to invent improvements in boats and guns, and his theoretic tendency led him to conceive and publish (1860) a *New Method of Measuring the Human Figure.* At times he lectured on art, and his conversational powers were unusual.

PAGEANT, n. *păj'ĕnt* [Gr. and L. *pēgma*, a kind of stage or scaffolding used in Roman amphitheatres: mid. L. *pagĭna*, a movable machine or scaffold for an exhibition, the exhibition itself]: a gorgeous or splendid show; anything intended for mere pomp or display; anything showy without stability: ADJ. showy; ostentatious; superficial. PAGEANTRY, n. *păj'ĕnt-rĭ*, ostentatious show or display.

PAGET, *păj'ĕt*, FAMILY OF: noble family in England, said to be of Norman extraction, but not tracing their descent further back than the reign of Henry VII., in whose time one William P. held the office of one of the sergeants-at-mace of the city of London. His son William P., who was educated at St. Paul's School and at Cambridge, was introduced into public life by Stephen Gardiner, bp. of Winchester, early in the reign of Henry VIII., who sent him abroad to obtain the opinions of foreign doctors as to the king's contemplated divorce from Catharine of Aragon. From this time forth, his rise was rapid, and he was constantly employed in diplomatic missions until the death of the king, who appointed him one of his executors. He then adhered to the party of the Protector Somerset, and was raised to the peerage 1552, as Lord Paget of Beaudesert. He shared in the power and in the fall of the Protector, and was heavily fined by the star chamber, and deprived of the insignia of the order of the Garter. His disgrace, however, was not of long continuance, and, a change taking place in the councils of his opponents, he soon obtained his pardon. On the accession of Queen Mary, he was sworn a member of the privy council, and obtained several large grants of lands. He retired from public life on the accession of Elizabeth, who regarded him with much favor, though he was a strict Rom. Catholic. The representative of the family adhered to the cause of Mary, Queen of Scots, and suffered, in consequence, the confiscation of his property. The fifth Lord P. so far departed from the traditionary policy of the family as to accept from the parliament the lord-lieutenancy of Buckinghamshire; but he returned to his old allegiance shortly afterward, and held the command of a regt. under the royal standard at the battle of Edgehill. His grandson was advanced to the earldom of Uxbridge, but, this title becoming extinct, the representation of the family devolved on a woman, who carried the barony of P. by marriage into the house of Bayly. The son of this marriage, however, having assumed the name Paget, obtained a renewal of the earldom of Uxbridge, and the second earl, for his gallantry at Waterloo, was advanced to the marquisate of Anglesey. Of late years, the P. family have usually held three or four seats in every parliament, and they have constantly supported the liberal party.

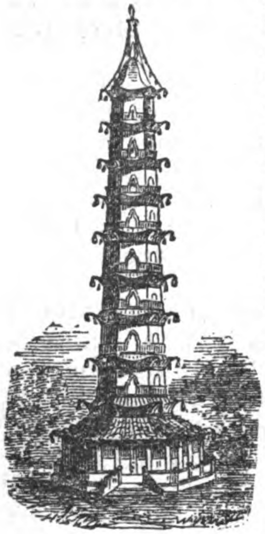
PAGINA, n. *pā'jĭ-nă*, PAGINÆ, n. plu. *pā'jĭ-nē* [L. *pāgĭna*, a page or leaf]: in *bot.*, the surface of a leaf; any flat surface.

PAGING-MACHINE: machine for paging books and numbering bank-notes, checks, railway-tickets, and similar papers. The great object of such machines is to prevent the chance of error or fraud by making it impossible that a page, check, etc., can be abstracted or lost without detection. In an ingenious machine, perfected in London—the page numbers having been engraved on metal rowels, usually of steel or brass—a series of these rowels are so arranged that, when the machine is worked, the numbers must be impressed on the paper in regular succession from 1 to 99,999; and it is impossible to produce a duplicate number until the whole series has been printed. The instrument is made to supply ink to the types, so that it may be locked in such a manner as to admit of being worked without the chance of its being tampered with. An extremely ingenious modification of this machine, perfected by Auguste Trouillet of Paris, under the name 'Numérateur Mécanique,' is more simple, and admits of wider application; for it not only pages books and numbers notes, tickets, etc., but can be used also for numbering bales and packages of merchandise. The instrument has six rowels, on each of which is a set of engraved numbers, so arranged that their revolutions produce in regular succession the required numbers, by the action of a lever which moves horizontally, and supplies the type with ink as it moves forward and backward.

PAGO, *pâ′gō:* island belonging to the Austrian crownland of Dalmatia, separated from Croatia by the Morlacca canal, a channel two to three m. wide. The island, parallel to the Croatian coast, is long and narrow, and has 108 sq. m. The people are most industrious, and support themselves by vine-culture, manufacture of salt, and fishing. Pop. 5,150.

PAGODA, n. *pă-gō′dă*, or PAGOD, n. *pā′gŏd* [Port. *pagao*, a pagan; *pagode*, an assembly of idolaters, a temple of the Indians—according to some, a corruption of the Sanskrit word *bhâgavata*, from *bhagavat*, sacred; according to others, a corruption of *put-gada*, from the Persian *put*, idol, and *gada*, house]: a Hindu temple containing an idol; the idol itself; a name applied by Europeans to numerous Indian gold coins. PAGODA-STONE, the name given in China to a limestone containing tapering fossil shells, so called because when cut and polished they appear as a tapering pagoda. PAGODITE, n. *pă′gō-dīt*, the stone which the Chinese carve into ornamental figures and pagodas; figure-stone.—*Pagoda* is the name of certain Hindu temples, which are among the most remarkable monuments of Hindu architecture. Though the word itself designates but the temple where the deity —especially S′iva and his consort Durgâ or Pârvatî—was worshipped, a P. is in reality an aggregate of various monuments, which, in their totality, constitute the holy place sacred to the god. Sanctuaries, porches, colonnades, gateways, walls, tanks, etc., are generally combined for this purpose, according to a plan more or less uniform. Several series of walls form an inclosure; between them are allies, habitations for the priests, etc., and the interior is occupied by the temple itself, with buildings for the pilgrims, tanks, porticoes, and open colonnades. The walls have, at their openings, *gopuras*, or large pyramidal gateways, higher than themselves, and so constructed that the gopura of the outer wall is always higher than that of the succeeding inner wall, the P. itself being smaller than the smallest gopura. The extent of the inclosing walls is usually considerable; in most instances, they consist of colossal hewn stones placed upon one another without mortar or cement, but with such admirable accuracy that their joints are scarcely visible. The gateways are pyramidal buildings of most elaborate workmanship; they consist of several, sometimes as many as 15, stories. The pagodas themselves, too, are pyramidal, various layers of stones having been piled upon one another in successive recession; in some pagodas, however, the pyramidal form begins only with the higher stories, the broad basis extending to about a third of the height of the whole building. The sides of the different terraces are vertical; but the transition from one to the other is effected by a vault surmounted by a series of small cupolas, which hide the vault itself. A single cupola, hewn out of the stone, and surmounted by a globe, generally crowns the whole structure; but sometimes the latter also ends in fantastical spires of a fanlike shape or concave roofs. The pagodas are covered all over with the richest ornamentation. The pilasters and columns, prominent in the ornamental portion of these temples, show the greatest variety of forms; some pagodas are also overlaid with strips of copper having the appearance of gold. The most celebrated pagodas on the mainland of India are those of Mathura, Trichinopoli, Chalambron, Konjeveram, Jaggernaut, and Deogur, near Ellora.—That of Mathura consists of four stories, and is about 63 ft. high; its base comprises about 40 sq. ft. Its first story is of hewn stones, copper, and covered with gilt; the others are of brick. A great number of figures, especially representing deities, tigers, and elephants, cover the building.—The P. of Tanjore is the most beautiful monument of this kind in s. India; its height is 200 ft., and the width of its basis is equal to two-thirds of its height.—The P. of Trichinopoli is on a hill, about 300 ft. above the plain; it differs in style from other pagodas dedicated to Brahminical worship, and exhibits great similarity to the Buddhistic monuments of Tibet.—The great P. of Chalambron, in Tanjore, is one of the most famous and one of the most sacred of India: it is dedicated to S'iva and Pârvatî, and filled with representations pertaining to the mythical history of these gods. The buildings of which this P. is composed cover an oblong square, 360 ft. long, 210 ft. wide.—At Konjeveram are two pagodas—one dedicated to S'iva, the other to Pârvatî.—The pagodas of

Jaggernaut, on the n. end of the coast of Coromandel, are three; they are in honor of S'iva, and are surrounded by a wall of black stones—whence they are called by Europeans the Black Pagodas—measuring 1,122 ft. in length, 696 ft. in width, 24 ft. in height. The height of the principal of these three pagodas is said to be 344 ft.; according to some, however, it does not exceed 120–123 ft.—The P. of Deogur, near Ellora, also consists of three pagodas, sacred to S'iva; they have no sculptures, however, except a trident, the weapon of S'iva, which is visible on the top of one of these temples.—The monuments of Mavalipura, on the coast of Coromandel, are generally called the Seven Pagodas; but as these monuments—rather a whole city, than merely temples—are buildings cut out of the living rock, they belong properly to the rock-cut monuments of India, rather than to the special class of Indian architecture comprised under the term pagoda.



Porcelain Tower of Nanking.

The term P. is applied loosely also to those Chinese buildings, of tower-form, which consist of several stories, each story containing a single room, and surrounded by a gallery covered with a protruding roof. These buildings differ materially from the Hindu pagodas, not only in style and exterior appearance, but also in their design for other than religious purposes. The Chinese call them *Ta*, and they are erected usually in commemoration of a celebrated personage or some remarkable event; and for this reason, too, on some elevated spot, where they may be conspicuous, and add to the charms of the scenery. Some of these buildings have a height of 160 ft.; the finest known specimen of them is the famous Porcelain Tower of Nanking (q.v.). The application of the name P. to a Chinese temple should be discountenanced; for, as a rule, a Chinese temple is an insignificant building of wood, seldom more than two stories high; the exceptions are rare, and where they occur, as at Peking, such temples, however magnificent, have no architectural affinity with a Hindu pagoda.

PAGURIAN, n. *pă-gū'rĭ-ăn* [L. *păgūrus;* Gr. *pagouros,* a species of crab-fish]: the hermit crab, having the well-known habit of appropriating the deserted shells of whelks and other univalves for the protection of its defenseless abdomen. PAGURUS, n. *pă-gū'rŭs*, the systematic name of the tribe of crustaceans (*Paguridæ*) of which the hermit crab is the type: see HERMIT CRAB.

PAGUS, n. *pā′gŭs* [L. district, canton (see PAGAN)]: anciently, among the Romans, a stronghold or fortified place in which the inhabitants of a rural district took refuge in the event of a sudden invasion.—In the early history of the Teutonic peoples, P. designated an aggregation of inhabitants or a political division larger or more populous than a village (*vicus*). In England it was equivalent to *wapentake* or *hundred*.

PAHLANPUR, *pâl-an-pôr′*: town of India, cap. of the state of P., 260 m. e.s.e. of Hyderabad. It is a walled town, seat of extensive trade and of several manufactures. Pop. 20,000.

The *state* of P. is in the province of Guzerat, Bombay; 2,400 sq. m., and a pop. of 230,000; revenue of £40,000, paying annual tribute of £5,000 to the Guicowar, and £600 per annum for a British political agent. The ruling family is Moslem, the people mainly Hindus. The products are wheat, rice, sugar-cane, and cotton. In the s. and e., three crops are obtained in the year. Pop. 230,000.

The *P. agency* comprises P. and ten other states; 8,000 sq. m. Of the 11 states, 4 (including P.) are Mohammedan, the others Hindu; and five of the ruling families are Rajput. Pop. of agency (1881) 576,478.

PAHLAVI, *paw-law-vē′*, or PEHLEVI, *pâ-lâ-vē′* [Persian, *pahlavi*, valor, power; *Zabán Pehlevi* = Language of Heroes]: ancient West-Iranian (Median and Persian) idiom, in use chiefly during the period of the Sassanides (A.D. 235–640), who, wishing fully to restore the anc. Persian empire, endeavored also to reinstate the primitive national language, fallen into disuse as a court-language since the time of Alexander's conquest. Yet they chose not the pure Persian as it was still spoken in the interior, but the dialect of the w. provinces, largely mixed with Semitic words, to which Arian terminations were affixed. The grammatical structure of the P. presents almost the same poverty of inflections and terminations as the present Persian. Although less rich than Zend (q.v.) in inflection and accentuation, it yet has the same copiousness of words as that dialect, to which it in reality succeeded. It is written from right to left, and the letters are mostly joined. The remnants of P. extant consist of coins, inscriptions (found at Hajiabad, Persepolis, Kermanshah, etc.), and a number of books, all relating to the religion of Zoroaster. The most important of these are the translation of the chief part of the Zend-Avesta (Yazna, Visparad, and Vendidâd), and such original religious works as the Bundehesh, Shikand-gumâni, Dinkart, Atash Barâm, etc. The P. of the books differs from that of the inscriptions and coins to such a degree—according to the larger or smaller preponderance of the Semitic element—as to have misled investigators (Westergaard and others) to assume that two utterly distinct languages, a purely Iranic and a Semitic one, had been used somewhat indiscriminately at the time. The non-Iranian element is called Huzvaresh (Huzooresh) by the Parsee priests, who, taking advantage of the ambiguity of the P. alphabet, often substitute the corresponding Persian for the foreign words. The Iranian part of the P. differs little from the Persian of our own day, and, in fact, the P. changed first into Parsee, and subsequently into modern Persian, simply by ridding itself first of its Chaldee, then of those of its Iranian, words which had become obsolete. The chief use of the P. dialect at present is the assistance that it offers toward the elucidation of the Zend itself. For the history of its investigation since it was first made known in Europe, see PERSIAN LANGUAGE AND LITERATURE.

PAID: see under PAY.

PAIDEUTICS, n. plu. *pī-dū′tĭks* [Gr. *paideutĭkos*, pertaining to instruction—from *paideu′ō*, I bring up a child—from *pais* or *paida*, a child]: science or theory of instruction; school management; the best methods of instructing children.

PAIGLE, n. *pā′gl*, or PAGIL, *pā′jĭl* [F. *épingle*, a pin, from the likeness of the style and stigma to a pin stuck in the germ—from mid. L. *spin′ula*, a little thorn]: the cowslip.

PAIL, n. *pāl* [W. *paeol*, a pail or pot: OF. *pœle*, a pot, a pail: Gr. *pella*, a milk-pail: It. *padella*, a pan: Sp. *paila*, a basin]: an open vessel with a moving handle attached to the rim in two places, used for carrying liquids. PAILFUL, n. *pāl′fûl*, the quantity that a pail will hold; plu. PAILFULS. MILK-PAIL, a pail for carrying milk.

PAILA: according to the Purân′as (q.v.), one of the disciples of Vyâsa (q.v.), the reputed arranger of the Vedas (q.v.): he was taught by the latter the R′igveda, and, on his part, communicated this knowledge to Bâshkali and Indrapramati. This tradition, therefore, implies that P. was one of the earliest compilers of the R′igveda.

PAILLASSE, n. *păl-yăs′* [F. *paillasse*, a straw-bed—from *paille*, straw]: an under mattress of straw—also spelled PALLIASSE. PAILLASSON, *pă-lyă-sawng′*, kind of straw bonnet for women, introduced about 1850.

PAILLETTES, n. plu. *pâ′ĭ-ĕtz′* [F.—from *paille*, straw, chaff—from L. *palĕă*, chaff]: small disks of metal, pierced in the middle, for attaching to stuffs and dresses, for the purposes of ornament; spangles. PAILLONS, n. plu. *pâ′ĭ-ŏnz* [F. *paillons*, spangles]: small leaves of very thin-beaten copper, colored, and used for ornamental purposes on theatrical dresses, or as backing for precious stones.

PAIN, n. *pān* [F. *peine*, pain, penalty: Dut. *pijne*; Ger. *pein*, pain, trouble: W. *poen*; Gael. *pian*, pain, punishment: Icel. *pina*, to torment, to punish: L. *pœna*; Gr. *poinē*, penalty, punishment]: sensation of uneasiness, distress, or torture in animals, resulting from injury to the body or derangement of its functions (see below): uneasiness of mind; mental suffering; penalty; punishment denounced or suffered: V. to torture; to distress; to render uneasy in body or mind; to trouble; to grieve. Pains, n. plu. *pānz*, work; toil; laborious or diligent effort; the throes of travail. Pain′ing, imp. Pained, pp. *pānd*. Pain′ful, a. *-fûl*, giving or causing pain; miserable; laborious. Pain′fully, ad. *-lĭ*. Pain′fulness, n. *-nĕs*, the quality or condition of being painful. Pain′less, a. *-lĕs*, free from pain. Pain′lessly, ad. *-lĭ*. Pain′lessness, n. *-nĕs*, the state or quality of being without pain. Painstaking, a. *pānz′tā-kĭng* [*pains*, and *taking*]: carefully industrious; laborious: N. careful and conscientious exertion. Pains′taker, n. one who takes pains. Painsworthy, *pānz′wĕr′thĭ*, deserving of care or pains. Bill of pains and penalties, in *Eng. hist.* (see Pains and Penalties).—Syn. of 'pain, n.': suffering; agony; anguish; pang; evil; distress; uneasiness; disquietude; anxiety; grief; solicitude; effort; task; work; toil; trouble;—of 'pain, v.': to afflict; disquiet; aggrieve; torment; agonize; torture;—of 'painful': distressing; difficult; arduous; disquieting; troublesome; afflictive; grievous; toilsome.

PAIN: undefinable sensation, of the nature of which all persons are conscious. It resides exclusively in the nervous system, but may originate from various sources. Irritation, or excessive excitement of the nervous system, may produce it; it frequently precedes and accompanies inflammation; while it sometimes occurs in, and seems to be favored by, a state of positive depression, as in the intense pain often experienced in a limb benumbed with cold, in the pain which not unfrequently accompanies palsy, and in the well-known fact that neuralgia is a common result of general debility. Hence, pain must on no account be regarded as a certain indication of inflammation, though it rarely happens that pain is not felt at some period or other in inflammatory diseases. Moreover, the pain that belongs to inflammation varies very much, according to the organ or tissue affected; the pain, for example, in inflammation of the lungs, differs altogether in character from that in inflammation of the bowels, and both these pains differ from that in inflammation of the kidneys.

Pain varies not only in its character, which may be dull, sharp, aching, tearing, gnawing, stabbing, etc., but in its mode of occurrence—e.g., it may be flying or persistent, intermittent, remittent, or continued. It is not always that the pain is felt in the spot where its cause exists. Thus, inflammation of the liver or diaphragm may cause pain in the right shoulder; the irritation caused by a stone in the bladder produces pain at the outlet of the urinary passage; disease of the hip-joint occasions pain in the knee; disease of the heart is often accompanied with pain in the left arm; and irritation of the stomach often gives rise to headache. Pain is differently felt by persons of different constitutions and temperaments, some persons being little sensitive to painful impressions of any kind, while others suffer greatly from slight causes. There seem to be even national differences in this respect; and before the introduction of chloroform, it was commonly observed that Irishmen were more troublesome subjects for surgical operations than either Englishmen or Scotchmen; and the negro is probably less sensitive to pain than any of the white races.

Although in most cases pain is to be regarded as merely a symptom to be removed only by means which remove the lesion which occasions it, there are cases in which, though it is only a symptom, it constitutes a chief element of disease, and one against which remedies must be specially directed. Examples of these cases are neuralgia, gastralgia, colic, dysmenorrhea, and perforation of the intestines; and, in less degree, the stitch of pleurisy, which, if not relieved, impedes the respiration, and the pain of tenesmus, which often causes such efforts to empty the lower bowel as seriously to disturb the functions of the intestines and to exhaust the strength.

For the methods of relieving pain, see the titles of the different diseases in which it specially occurs—e.g., COLIC: NEURALGIA: PLEURISY: ETC.: see also CHLOROFORM: ETHER: HEMP, INDIAN: MORPHIA: NARCOTIC: OPIUM: ETC.

PAINE, *pān*, ELIJAH, LL.D.: 1757, Jan. 21—1842, Apr. 28; b. Brooklyn, Conn. He graduated from Harvard 1781, and after studying law removed to Vt., and commenced practice. He was prominent in the revision of the state constitution 1786, member of the legislature 1787–91, supreme-court judge 1791–95, member of the U. S. senate 1795–1801, and a U. S. dist. judge from the latter year till his death. He did much to develop agriculture and manufactures in Vt., was one of the first American manufacturers of woolen cloth, was a member of several learned societies, and a liberal supporter of educational institutions. He died at Williamstown, Vermont.

PAINE, MARTYN, M.D., LL.D.: 1794, July 8—1877, Nov. 10; b. Williamstown, Vt.; son of Elijah P., LL.D. He graduated from Harvard 1813, studied medicine, was a physician in Montreal 1816–22, and in the latter year removed to New York, where he became prominent in his profession. He was one of the founders of the Univ. Medical College, in which he was a prof. 1841–67. He published several important works, including *The Institutes of Medicine* (1847, 9th ed. 1870). He died at New York.

PAINE, *pān*, **Robert Treat**, LL.D.: 1731, Mar. 11—1814, May 11; b. Boston. He graduated from Harvard 1749, made a business trip to Europe, studied theology, and 1755 became chaplain of the colonial troops near Canada. He afterward occasionally supplied various pulpits in and near Boston; taught school to obtain means for studying law; and 1759 commenced practice at Boston, but removed to Taunton. The attorney-general being absent, P. managed the prosecution of Capt. Preston and his company, for the massacre at Boston 1770; was a member of the Mass. general assembly, of the provincial congress 1774–5, and of the continental congress 1774–78. He was one of the signers of the Declaration of Independence, was a member of the Mass. constitutional convention, atty.gen. 10 years from 1780, and supreme-court judge 1790–1804, resigning in the latter year. He was one of the founders of the American Acad. of Arts and Sciences. He died in Boston.

PAINE, Robert Treat, Jr.: 1773, Dec. 9—1811, Nov. 13; b. Taunton, Mass. He was named Thomas, but, to avoid being confused with the famous deist, secured permission 1801 from the legislature to change his name to Robert Treat. He graduated from Harvard 1792, published the *Federal Orrery* semi-weekly 1794, became 'master of ceremonies' at the Federal Theatre, and married an actress. The personalities in his paper and his connection with the stage brought him into disrepute with good society. He studied law, practiced with Theophilus Parsons in Boston 1802, but the following year resumed his theatrical associations. His last years were far from prosperous. His principal literary productions were two poems, *The Invention of Letters* (1795) and *The Ruling Passion* (1797); and a song, *Adams and Liberty* (1798). His writings, with a *Memoir* by Charles Prentiss, were published 1812. He died in Boston.

PAINE, Thomas: author famous for his connection with the American and French revolutions, and for his advocacy of infidel opinions: 1737, Jan. 29—1809, June 8; b. Thetford, county of Norfolk, England. He was trained to the business of his father, who was a Quaker staymaker, but afterward obtained a situation in the customs, and the management of a tobacco-manufactory. His income, however, was small, and he fell into debt, and was dismissed 1774. He went to America, was favorably received by a bookseller in Philadelphia, and 1776 published a pamphlet entitled *Common Sense*, written in popular style, in which he maintained the cause of the colonies against the mother country. The success and influence of this publication were extraordinary, and it won him the friendship of Washington, Franklin, and other distinguished American leaders. It doubtless turned the popular mind at that critical point in the struggle; but the assertion sometimes made that P. was author of the original draft of the Declaration of Independence is without proof. After peace was declared, P.—in view of his patriotic services and sacrifices—was rewarded by congress with $3,000 and the appointment of sec. to the committee of foreign affairs, and by the state of N. Y. with a large farm in Westchester co. He visited France in the summer of 1787, where he made the acquaintance of Buffon, Malesherbes, La Rochefoucauld, and other eminent men; and, in the autumn following, went to England, where, 1791, he published *The Rights of Man*, the most famous of all the replies to Burke's *Reflections upon the French Revolution*. The work has gone through innumerable editions, and has been translated into almost all the languages of Europe. His defense of the principles of the French Revolution, against the magnificent assault of Burke and the outcry of the English aristocracy, is vigorous, and not unsuccessful. But the value and the popularity of the work have been injured by its advocacy of extreme liberal opinions. His assaults on the British constitution exposed him to a government prosecution, and he fled to France, where he was admitted to citizenship; and 1792 the dept. of Pas-de-Calais elected him a deputy to the national convention, where he voted with the Girondists. At the trial of Louis XVI., says Madame de Staël, 'Thomas Paine alone proposed what would have done honor to France if it had been accepted—the offer to the king of an asylum in America,' by which he offended the Mountain party; and 1793 Robespierre caused him to be ejected from the convention, on the ground of his being a foreigner, and thrown into prison. During his imprisonment, he wrote *The Age of Reason*, against Atheism and against Christianity, and in favor of Deism. After an imprisonment of 14 months, he was released, on the intercession of the American govt., and restored to his seat in the convention. He was chosen by Napoleon to introduce a popular form of govt. into Britain, after the Frenchman should have invaded and conquered the island. But as Napoleon did not carry out his design, P. was deprived of an opportunity of playing the part of legislator for his conquered countrymen. He then retired into private life, and occupied himself with the study of finance. In 1802 he returned to the United States, and died at New Rochelle, N. Y. His admirer, the radical William Cobbett, removed P.'s bones to England a few years later; and it is believed that they were afterward removed to France.

P. was an 18th-c. deist, disbelieving in revealed religion, but a strong believer in the existence of a God, and with high estimate of Christain virtues. His *Rights of Man* is written with considerable dignity and force; his *Age of Reason*, produced after his arrest and before his imprisonment in France, is not only feeble, compared with recent attacks on the Christian Scriptures, but is also coarse, scurrilous, and passionate. Benjamin Franklin advised him to 'burn it before it was seen by any other person.' P., though of an impulsive nature, arrogant, improvident, irregular in life, and lacking self-control—and in his last years falling under the vice of intemperance, as is usually believed—was not without kindliness and generosity. Separated from his wife, and without children or kindred in this country, his last years were clouded. His coarse and ignorant attack on Christianity has doubtless dimmed his rightful lustre as a defender of human rights. The most complete ed. of his works is by J. P. Mendum (Bost. 1856); the most noted of his numerous biographers is William Cobbett (1796).

PAINESVILLE, *pānz'vĭl:* town, cap. Lake co., O.; on the New York Chicago and St. Louis, the Pittsburg and Western, and the Lake Shore and Michigan Southern railroads, and on the Grand river; 29 m. from Cleveland. The river is deep and wide, furnishing an excellent harbor only 3 m. from Lake Erie. There are excellent public schools and a female seminary; 4 weekly newspapers; 1 national bank (cap. $200,000), 1 private bank, and 1 savings and loan association. It is in a fine agricultural region, and has flour-mills, machine-shops, and factories of various kinds. Pop. (1870) 3,728; (1880) 3,841.

PAINIM: see PAYNIM.

PAINS AND PENALTIES: in Eng. history, a species of process employed to punish state offenders out of the ordinary course of justice. When a person has committed some crime of peculiar enormity, for which no adequate punishment is provided by the ordinary law, the mode of proceeding is by introducing into parliament a bill of pains and penalties, involving a punishment extraordinary and anomalous. These bills are now seldom resorted to, and the latest attempt to revive this form of process was by the ministers of George IV. against Queen Caroline, 1820, an attempt which was signally defeated. When a bill of this kind is resolved upon, it is introduced, and passes through all the stages like any other bill in parliament, except that the party proceeded against is allowed to make defense by counsel and witnesses. The proceeding is substantially an indictment, though in form a bill.

PAINT, n. *pānt* [F. *peindre*, to paint: OF. *paint*, painted—from L. *pictus*, painted: Sp. *pintar*, to paint]: a coloring substance; a pigment (see PAINTS): V. to represent by colors or images; to cover with a color or colors; to represent to the mind; to describe; to lay colors on the face. PAINTING, imp. *pānt'ĭng:* N. the art of laying on colors, or of representing objects by delineations and colors; a picture; a painted resemblance (see below). PAINT'ED, pp. PAINT'ER, n. *-ėr*, one who paints (see PAINTING, below). PAINTERS' COLIC, a disease, terminating in palsy and mental imbecility, peculiar to painters and workers in lead (see LEAD-POISONING). **PAINTER'S CREAM**, composition used by artists to cover oil-paintings in progress, when they temporarily quit their work; it prevents drying, and the consequent showing of lines where new work is begun. It consists of six parts of fine nut-oil and one part of gum-mastic. The mastic is dissolved in the oil, and then is added a quarter part of acetate, or sugar of lead, finely triturated with a few drops of the oil. When all these substances are well incorporated, water must be added, and thoroughly mixed, until the whole has the consistency of cream. It is applied with a soft brush, and can easily be removed with water and a sponge. PAINTER-STAINER, a painter of coats of arms. HOUSE-PAINTING (see PAINTING, HOUSE). ASBESTOS PAINT, *ăs-bĕs′tŏs*, ground asbestos mixed with coloring matters and oils; used for covering interior woodwork, which the asbestos body renders to some extent fireproof, and for coating roofs, as a protection against sparks. LUMINOUS PAINT, phosphorescent substance used as a coating for surfaces. The phenomenon of phosphorescence, which gives to L. P. its distinctive character, has nothing to do with phosphorus, whose luminosity is due to slow oxidation. The first discovery of a substance emitting light without oxidation belongs to the early part of the 17th c., when sulphide of barium (Bologna stone) and chloride of calcium (Homberg's phosphorus) were discovered. Sulphide of calcium dates from 1768; sulphide of strontium is the latest discovery in this kind. Any of these substances, if inclosed in a sealed glass tube and exposed to sunlight, and then carried into a dark room, appears at first brilliantly luminous, and long afterward like a hot body cooling. Practical application has been made of the property in the production of L. P., the above compounds being ground and mixed with a vehicle, as in ordinary paint, and laid on the surface that is to be made luminous.—SYN. of 'paint, v.': to color; draw; sketch; depict; picture; delineate; portray; diversify; represent; adorn; image.

PAINTER, n. *pānt′ėr* [OF. *pantiere*, a kind of snare for birds: It. *pantiera*, a fowling-net, a trammel: L. *panther*, a net for wild beasts: comp. Gael. *painntear;* Ir. *painteir*, a gin, a snare]: a rope used to fasten a boat to a ship or other object.

PAINTER, *pānt′ėr*, GAMALIEL: 1743, May 22—1819, May 21; b. New Haven, Conn. He was educated in the common schools; when a young man, removed to Vt., and 1773 built the first house in what is now the town of Middlebury. In the war of the revolution, he was captain of a company, and afterward a quartermaster; he was a member of the convention 1777 which proclaimed Vt. an independent state; represented his district in the legislature; and was appointed one of the county-court judges. He was a member of the first convention to draft a state constitution 1793, and was a councilor 1813–4. He was one of the leading founders of Middlebury College, and in his will gave it $10,000. He died at Middlebury.

PAINT'ING: art of representing objects to the eye on a flat surface by means of lines and color, with a view to convey ideas and awaken emotions: see ART. As one of the fine arts, P. occupies a prominent place; some claim for it the first place, as combining the chief elements—namely, form, light and shade, and color. As compared, however, with music and poetry, it lacks the important element of movement, the representation being confined largely to one aspect and one instant of time. In its ruder and more elementary forms, in which the primary design was to communicate ideas, P. is perhaps the oldest of the arts, older, at all events, than writing (see ALPHABET: HIEROGLYPHICS); and, as a vehicle of knowledge, it possesses this advantage over writing—that no *description*, however minute, can convey so accurate and distinct an idea of an object as a pictorial representation, much less make so vivid an impression. Besides this, it is not limited, as writing is, by differences of language, but speaks alike to all nations and all ages.

The great antiquity of P. is proved by remains discovered in Egypt, and by reference to it in ancient writings. It has been ascertained that as early as B.C. 19th c., the walls and temples of Thebes were decorated by painting and sculpture. Ezekiel, who prophesied about B.C. 598, refers to paintings in Jerusalem after the manner of the Babylonians and Chaldæans. Though no specimens have come down to us, it is evident that paintings of the highest excellence were executed in Greece. This is proved by what is recorded of them; for the subjects of many of those mentioned required the putting forth in a high degree of all the qualities requisite for the production of the greatest historical works, such as form, grouping, expression, foreshortening. From the immense sums given for paintings, the care with which they were preserved in temples and other public buildings, and from the fact of the high state of sculpture at contemporary periods, as proved by well-known works extant, it may be deduced that P., which, like sculpture, is based on design or drawing, must have occupied an equally high position. Even the imperfect specimens discovered in Pompeii, where the style and influence of Greek art may be traced to some extent, lead to conclusions favorable to the high position of P. in classic times. The chief schools of P. in Greece were those of Sicyon, Corinth, Athens, and Rhodes. The first great artist of whose works there is any authentic description, and from details of which an idea may be formed of his attainments, is Polygnotus of Thasos (B.C. 420), who painted, among other works, those in the Pœcile, a celebrated portico at Athens, and the Lesche, or public hall at Delphi.

The works of Apollodorus of Athens (B.C. 408) are described and highly praised by Pliny. Zeuxis, pupil of Apollodorus, Eupompus, Androcides, Parrhasius (q.v.) the Ephesian, and Timanthes of Sicyon, prosecuted painting with distinguished success; and by them it was carried down to the time of Philip, father of Alexander.

Of the same period was Pamphilus, celebrated not only for his works, but as the master of the artist universally acknowledged as the greatest of ancient painters, Apelles (q.v.), who was born probably at Colophon, and lived in the latter half of B.C. 4th c. He was highly esteemed by Alexander the Great, and executed many important works for that monarch. Protogenes of Rhodes was a contemporary, and may be styled the rival of Apelles, who greatly admired his works. His picture of Ialysus the hunter and the nymph Rhodos was preserved for many years in the Temple of Peace at Rome. Art in Greece had then reached its highest point; its course thereafter was downward.

In Italy, art was followed at a very early period by the Etruscans, and, according to Pliny, P., as well as sculpture, was successfully practiced in Ardea and Lanuvium, cities of Latium, perhaps more ancient than Rome. The finest specimens of Etruscan art, however—as the paintings on tombs, and the remains of armor and fictile ware ornamented with figures, evince unmistakably the influence of, or rather are identical with Greek art. According to Pliny, it was introduced from Corinth about B.C. 650. No great national school of P. ever flourished in Rome, for though the names of Romans who were painters are cited, the principal works of art that adorned the temples and palaces of Rome were obtained from Greece, and it is probable that many of the paintings executed there were by Greek artists. When the seat of empire was transferred to the East, such art as then remained was carried with it, and in a new phase was afterward recognized as Byzantine art—a conventional style, in which certain typical forms were adopted and continually repeated. This mode has been preserved, and is practiced in church-painting in Russia at the present day.

Much discussion has arisen in modern times as to the supposed technical modes or processes of P. employed by the ancients. It seems established that P. in fresco was much practiced; but many of the most valuable pictures of which we read were removable, and there are accounts of some carried from Greece to Rome. 'The Greeks preferred movable pictures, which could be taken away in case of fire' (*Wilkinson on Egyptian and Greek Paintings*), and Pliny says Apelles never painted on walls; besides fresco paintings on walls, therefore, there can be no doubt that the ancients painted on boards; indeed, the name *Tabula* or *Tabula picta* proves this, and it seems now generally acknowledged that these were executed in tempora—that is, with size, and probably fixed or protected by some kind of varnish, in the preparation of which oil was used; or in encaustic, a process in which wax was employed to fix and give brilliancy and depth to the colors, heat being applied in working with it.

Painting was revived in Europe in the 13th c.; previous to that period, Byzantine artists chiefly were employed. On the conquest of Constantinople by the Latins 1204, the Byzantine school was broken up, and many Greek artists were transplanted to Italy, where art was then destined to flourish, so the works of the Italians who profited by their instructions, were necessarily, at the commencement, composed in the Byzantine style. The first Italian whose name is associated with the revival of Italian art is Guido of Siena; a work by him, a large Madonna, inscribed with his name and the date 1221, is still preserved in that city. The next is Giunto da Pisa (1236). But Giovanni Cimabue (q.v.), (1240-1300), is commonly styled the founder of the Italian school. Several works of considerable importance are ascribed to him; and though he followed the Byzantine arrangement, he ventured occasionally out of the path, introduced the study of nature in his drawing, and imparted a greater degree of softness to his P. than the Byzantine artists. The influence of Byzantine art was not confined to Italy; it operated in Germany, Bohemia, and France; but there also art began to assume a national character early in the 13th c., and paintings are still preserved at Cologne, dated 1224. The Italian school of P., or that style in which so many of the highest qualities of art have been so successfully carried out, received its chief impetus from Giotto (q.v.), son of Bordone, b. 1276 at Vespignano, near Florence, where he d. 1336. It is said that he was originally a shepherd-boy, and being discovered by Cimabue drawing a sheep on a slate, was instructed by him in painting. His style is distinguished from that of earlier painters by the introduction of natural incidents and impressions, by greater richness and variety of composition, by the dramatic interest of his groups, and by total disregard of the typical forms and conventional style of his predecessors. His influence was not confined to Florence, but extended over the whole of Italy; and works by this artist may be traced from Padua to Naples. Giotto followed Pope Clement V. to Avignon, and is said to have executed many important pictures there, and in other cities in France. The most celebrated of his frescoes extant are those at Assisi; some noted works by him in that class also remain at Padua, Florence, and Naples. Most of the small easel-pictures ascribed to him are of doubtful authenticity, but some preserved in the gallery at Florence are acknowledged genuine. His high powers as sculptor and architect also are exemplified by works in that city. Giotto had numerous scholars and imitators, and several of these have left works which show that while they profited by his instruction or example, they were also gifted with original talent. Among these were Taddeo Gaddi, favorite pupil of Giotto (b. 1300, living in 1352); Simone Memmi (1284–1344); and Andrea Orcagna (1329–89), one of the artists employed in the decoration of the celebrated Campo Santo at Pisa. P. in Italy continued to be impressed with the feeling and style of Giotto for more than a hundred years; but early in the 15th c., the frescoes executed by Masaccio (1401–43) in the Brancacci Chapel in the Carmelite

Church at Florence, clearly prove that it had entered on a new phase, and had come forth strengthened by an important element in which it had been deficient, viz., correct delineation of form, guided by the study of nature. These celebrated frescoes, 12 in number, were all at one time ascribed to Masaccio; but it seems now acknowledged by judges of art that two of these are by Masolino da Panicale (1378–1415), the master of Masaccio; and three, or probably four, and a small portion of one, by Filippino Lippi (1460–1505). The frescoes by Masaccio, however, are superior to those by Masolino and Lippi; and, indeed, for many of the highest qualities in art, have, as compositions, been surpassed only by Raphael in his celebrated cartoons. In about a century from Masaccio's time, P. in Italy attained its highest development; but before referring to those artists who are acknowledged as having carried P. to the highest elevation which it has attained since the middle ages, it is right to note the names of some of the painters who aided in raising it to that position. The works of Fra Giovanni da Fiesole (1387–1455) are highly valued and esteemed by many critics as the purest in point of style and feeling, and so the best fitted for devotional purposes. Confining his efforts to simple and graceful action, and sweet and tender expression, he adhered to the traditional types, and ventured on none of the bold innovations which were introduced in his time, and carried so far by Masaccio. His example, as regards feeling and expression, influenced many succeeding artists, particularly Pietro Perugino, the master of Raphael (1446–1524), and Francesco Francia of Bologna (1450 or 53—1517), by both of whom these qualities, united to greatly improved technical power, were brought to high excellence. Giovanni Bellini (1422–1512) founder of the early Venetian school, has left many admirable works; he had numerous scholars, among them Titian and Giorgione. Domenico Corradi or Ghirlandajo, under whom Michael Angelo studied, successfully followed out that direction given to art by Masaccio, which involved individuality of character and expression in the figures. Andrea Mantegna (1430–1506) of the school of Padua, with strong expression, gave an impetus to form, modelled on Greek or classic art. Luca Signorelli of Cortona (about 1440–1521), successfully exemplified powerful action and bold foreshortening, particularly in his frescoes at Orvieto, which, with his other works, are supposed to have strongly influenced the style of Michael Angelo. Antonello da Messina (1447–96) is said to have been a pupil of Jan Van Eyck, who imparted to him his secret in the preparation and use of oil-colors, the knowledge of which he spread among the Venetians. The above statement, however, as to the exact period at which oil-painting was introduced, is attended with much doubt. Painting with colors mixed in oil is mentioned by Italian writers before the period of Van Eyck; painting in tempera, or size, was continued in Italy, particularly in the Florentine and Roman schools, to the time of Raphael; and the transition from one method to the other has been so gradual, that many judges of art have expressed inability to determine whether the pictures of Perugino, Francia, and Raphael are in oil or tempera, or in both. The practice of painting on canvas, in place of wooden boards or panels, was introduced and carried on for a considerable time in Venice before it was adopted in other parts of Italy, and canvas is the material best suited for pictures in oil-colors when they are not of small dimensions; so, on the whole, the conclusion seems to be, that though oil-painting was not unknown in Florence and s. Italy, painting in tempera was practiced there longer than in Venice. At the date of the painters above referred to, there were many able artists in Germany, whose works are very highly prized. Among these, Jan Van Eyck (q.v.), (about 1390–1441), deserves special notice. To him is generally given the credit of being the first painter who used oil instead of size in his colors. His works are remarkable for brilliant and transparent coloring and high finish. He had numerous scholars; among these Justus of Ghent (lived about 1451), Hugo Vander Goes (d. 1480)—supposed to be the painter of the celebrated wings of an altar-piece, now at Holyrood Palace, containing portraits of James III. and his queen—Roger of Bruges (1365–1418), Hans Hemling or Memling (d. 1489), the best scholar of the Van Eyck school; Quintin Matsys (1450–1529), Jan Van Mabuse (1470–1532), Albert Dürer (q.v.), (1471–1528), Lucas Van Leyden (q.v.), (1494–1533). The career of the two last-named extended to the best period of art, and for many high qualities their works strongly compete with those of the ablest of the Italians; while portraits by Hans Holbein (q.v.), (1497–1554), and Antonio More (1512–88) rank with those of any school or period. The leading qualities in German art are invention, individuality of character, clearness of coloring, and high finish; but they are inferior to the Italians in embodying beauty; their representation of the nude is angular in form and deficient in elegance and grace; and in their draperies they do not attain the simplicity and grandeur of their southern competitors.

Anything like an account of the artists by whom P. was carried to its highest pitch, of sufficient comprehensiveness to exhibit their peculiar æsthetic qualities, cannot be attempted here (see biographical notices of distinguished painters in this work). In this view the next step is to note the relative positions generally assigned to the most distinguished painters of that period, with reference to the estimation in which their works are now held. Leonardo da Vinci (q.v.), (1452–1519), Michael Angelo Buonarotti (1474–1563), and Raphael or Raffaello Sanzio of Urbino (1483–1520), are universally acknowledged as the three greatest among the Italian artists; but two other names may be added as worthy of an equally high place—those of Titian (q.v.), (1477–1576), and Antonio Allegri, surnamed Correggio (q.v.), (1494–

1534). These five painters exhibit in their works, some of them the whole, others the greater portion of the various elements—united and more highly developed—which in the earlier periods of art had existed apart, and composed distinct styles; while each has taken up one of these elements, and carried it not only further than his predecessors had done, but further than his contemporaries, or any subsequent artist. Thus we see in Leonardo's celebrated picture of the 'Last Supper,' that though he has adopted the traditional style of composition handed down from Giotto's time, and carried out the religious feeling and dignified expression aimed at by the older masters, the whole is deepened and elevated by the manner of a mind and hand possessing mastery over all the elements combined in the highest productions of art. Michael Angelo was a proficient in all the qualities that constitute a painter, but he carried several of them—viz., grandeur of design, anatomical knowledge, and power of drawing—far beyond all other artists of his own or of later times. Titian and Correggio, again, with great power over every art-element, have each carried one quality further than all other artists—the former, color; the latter, light and shade. Raphael is generally allowed the first place among painters, for, though each of the four artists just referred to carried one, perhaps two, of the qualities of painting further than he did, he excelled them in every other element but the one for which each was particularly distinguished, and in several of the highest qualities of art he attained to greater excellence than any other artist; thus the expression of dignity of movement by broad masses and grand lines aimed at in the works of Masaccio, is successfully realized in the cartoons at Hampton Court; and the pictures in which Perugino and Francia so successfully embodied female beauty, maternal affection, and infantine purity, are as much inferior to pictures of similar subjects by Raphael as they are above those executed during the decadence of Italian art. Besides the five leading masters just referred to, there were many other Italian artists of great talent, who may be arranged in three classes: 1, the contemporaries of those artists; 2, those influenced by their style; 3, their scholars. Among their contemporaries, the works of Fra Bartolommeo (1469–1517) and Andrea Vanucchi, called Andrea del Sarto (1488–1530), both Florentines, deservedly rank very high. Giorgio Barbarelli, called Giorgione (1478–1511), was, under Bellini, a fellow-pupil of, and is generally styled the rival of, Titian; and his works, which are of great excellence, show him worthy of that name. In class 2, Correggio himself may rank as influenced by Leonardo's style, but the great prominence of his other qualities makes his style original and independent. On Bernardino Luini (b. about 1460, living 1530), Leonardo's influence is direct; and as he was an able painter, his pictures are very valuable for embodying many of those qualities in art which Leonardo had so much improved. Sebastiano del Piombo, a Venetian (1485–1547), studied under Giovanni Bellini and Giorgione; and after settling in Rome, became intimate with Michael Angelo, who employed him to paint some of his designs, with a view of benefiting by his admirable coloring. His pictures are greatly esteemed, as uniting rich color to grandeur of design. Class 3. All the five leading artists above referred to had pupils or scholars, particularly such of them as, like Raphael, were much engaged in extensive works in fresco, in the execution of which assistants are generally employed. Among the scholars of Michael Angelo, Daniele da Volterra (1509–66) was the best; and among Raphael's scholars, the first place is generally accorded to Giulio Pippi or Romano (q.v.), (1492–1546). After the first quarter of the 16th c., P. in Italy, except in the Venetian school, showed symptoms of rapid decline; that school, however, continued its vitality longer than any other in Italy, having flourished with all the life of originality during the whole 16th c. This is attested by the productions of many able Venetian painters; but among those, the works of Jacopo Robusti, or Tintoretto (q.v.), (1512–94), and Paolo Cagliari (q.v.) or Veronese (1528–88), are by far the most important. The pictures of the former exhibit great vigor in composition, and much richness of color—the former quality evincing the influence of Michael Angelo; the latter, that of Titian. Veronese ranks before even Tintoretto: his compositions are animated and full, and as a colorist he is a powerful rival to Titian, not aiming at the rich glow of that master's tints, but excelling every artist in producing the brilliancy and sparkling effect of mid-daylight on figures gorgeously attired, and seen against backgrounds enriched with landscape and architecture. The other great schools of Italy, however, as already said, had less vitality than the Venetian, and showed symptoms of decay at the end of the first quarter of the 16th c. Raphael left numerous scholars and assistants: many of these, after his death 1520, quitted Rome. The pillage of that city by the French under Bourbon 1527 also had the effect of dispersing them, and this naturally led to the style of Raphael, so far as they had been able to acquire it, being transplanted into other parts of Italy; but Raphael's style was founded on his own peculiar feeling for the beautiful, and on his own peculiar grace; and all that his scholars had acquired or could convey was a mere imitation of his external forms, without the spirit and pure feeling of which these forms are the expression. The imitation of Michael Angelo became the great object with the Florentines; but his scholars and imitators being unable to comprehend his powerful spirit, and not possessing his technical powers and theoretical knowledge, their pictures are merely exaggerated compositions of academic figures. Nor were Correggio's scholars more successful in following his walk, for they exaggerated the peculiarities of his style, which in their hands became affected and insipid. Leonardo's scholars repeated his distinguishing qualities, modified by their own individual peculiarities.—In this comparative view it may be noted that Ruskin made it his work to teach 'the supremacy of five great painters, Turner, Tintoret, Luini, Botticelli, and Carpaccio, despised till he spoke of them.'

The German painters who succeeded Dürer, Van Leyden, and the other celebrated artists of their period, above referred to, endeavored to improve their national style by the study of Italian art, at first attempting to combine the two styles, afterward to the close of the 16th c. devoting themselves exclusively to the study or imitation of the Italian painters. The works of these artists, the worst productions of any school, form a connecting link between those of the famous old German masters and the vigorous, varied, and attractive works of the painters of the Netherlands in the 17th c.

Toward the end of the 16th, and during the first half of the 17th c., a revival of art in Italy was attempted. This was sought in two ways by two classes of artists; the larger body were known as Eclectics, from their having endeavored to select and unite the best qualities of each of the great masters, combined with the study of nature; the other class were distinguished by the name of Naturalisti, and they aimed at forming an independent style, distinct from that of the earlier masters, based on the indiscriminate imitation of common life, treated in a bold and lively manner. In their development, both classes exercised an influence on each other, particularly the Naturalisti on the Eclectics. Eclectic schools arose in various parts of Italy, but the most celebrated was that at Bologna, founded by Lodovico Caracci (q.v.), (1555–1619), assisted by his two nephews, Agostino Caracci (1558–1602), and Annibale Caracci (1560–1609), the most eminent of the three. Many painters of mark were reared in this school; among those, Domenico Zampieri, called Domenichino (q.v.), (1581–1641), and Guido Reni (q.v.), (1575–1642), were by far the most eminent. The art of the Eclectics has been greatly overrated. Till recently, the leaders of that school were always placed on an equality with the best masters of the early part of the 16th c., and far above any of the painters of the 15th c. These notions have recently undergone complete change; it is now acknowledged that the attempt of the Eclectics to combine the excellences of various great masters, involves misapprehension with regard to the conception and practice of art, for the greatness of the earlier masters was brought out in their individual and peculiar qualities, the uniting of which implies a contradiction. Michael Angelo Amerighi da Caravaggio (q.v.), (1569–1609) was the founder of the Naturalisti school; he resided principally at Rome, but at a later period went to Naples, Malta, and Sicily. The Naturalisti were in their greatest strength at Naples, where they perseveringly opposed the followers of the Caracci, their leader being Giuseppi Ribera (q.v.), a Spaniard, hence called Spagnoletto (1593–1656). With much of the force of Caravaggio, he united more delicacy and greater vivacity of color. The historical or Scriptural subjects of Salvator Rosa (q.v.), (1615–73) are in the style of the school of the Naturalisti; but on account of his *genre* pieces and landscapes, Salvator is entitled to occupy the place of the originator of a style noted for certain qualities of poetic feeling. The influence of the school of the Naturalisti had more important results than that of the Eclectics, for it affected to some extent the leading masters of the Spanish school. At Rome, contemporaneously with Domenichino, Guido, and other leading masters of the schools of the Eclectics and Naturalisti, these three artists elevated landscape-painting to a high position—Nicholas Poussin (q.v.), a Frenchman (1594–1665); Claude Gelée, also native of France (1600–82), called Claude Lorraine (q.v.); and Gaspre Duchet, named Gaspar Poussin (q.v.), b. Rome, but son of a Frenchman (1613–75). Among the great masters who occasionally practiced landscape-painting as a distinct branch of art, the earliest were Titian and Giorgione; the Caracci (particularly Annibale) carried out their style with considerable success; the landscapes of Domenichino are esteemed, and other scholars of the Caracci turned their attention in that direction. The reputation of N. Poussin is principally based on his figure-pictures, the subjects of which were mythological and Scriptural. Into these pictures, he endeavored, with considerable success, to infuse the classical style; but his compositions were generally arranged with a large space of landscape background, which was in many cases not the least important portion of the picture; and these, and the pictures that he painted falling strictly under the class of landscapes, are distinguished for largeness of style and poetic feeling. Claude and Gaspar directed their efforts to landscape, and attained high eminence.

The earlier specimens of P. in Spain resemble in style the works of the old German painters, who seem to have disposed of many of their pictures in that country, while Spanish art of the 16th c. was modelled on that of Italy, Titian, and Raphael being the masters studied; but when works of the Spanish school are spoken of, those executed in the 17th c. are always understood to be referred to, as it was then that Spanish art became entirely national in feeling and style, and that is the period in which the best works of the school were produced. The two most distinguished Spanish painters are Don Diego Velasquez (q.v.), (1599–1660), and Bartholomé Esteban Murillo (q.v.), (1618–82). The portraits of the former are characterized by truthful and dignified expression, great breadth and vigorous handling, and rank with the best works of that class of any school; while the Scripture subjects of the latter, noted for tender expression, rich color, and powerful light and shade, may be classed with similar works by Rubens and Van Dyck. Spagnoletto, a Spanish painter, has been referred to as a leading artist of the school of the Naturalisti at Naples. Alonzo Cano (1601–67), Francisco Zurbaran (1598–1662), and Claudio Coello (between 1630 and 40—93), have high reputation. No name of a Spanish painter of eminence occurs after the close of the 17th century.

Very soon after the period when the eclectic and naturalistic schools arose in Italy, a revival of art occurred in the Netherlands also. This was very different in its effects from the revival in Italy, the only results from which were academical imitation of the older masters, and coarse naturalism, either separately or combined in varied proportions; while the works of the artists of the Netherlands executed about the same period, though they do not exhibit the high qualities found in the compositions of the Italian masters of the best period, possess many new and attractive features—freedom, originality of treatment, attention to the peculiar character of individual life, and the daily intercourse of men with each other in all its variety, and the study of nature, brought out with truth and delicacy of execution. Two important schools of art were established by this movement—the Flemish and the Dutch. The Flemish school flourished in Brabant, where the Rom. Cath. faith—then making strenuous efforts to oppose the reformed religion—still retained and actively employed art in its service. The Dutch school flourished in Prot. and republican Holland, where the artist, having to trust to private encouragement, painted, for the most part, familiar subjects from everyday life; and in place of altar-pieces for churches, and large historical and allegorical pictures for palaces, produced the subjects then in demand—portraits, genre pictures, or works in which life and manners are depicted in various phases—landscapes with and without figures, sea-pieces, battle-pieces, compositions representing hunting, animals, game, etc. The catalogue of the names of the able artists of these two schools is long; in the Flemish school originating with VAN EYCK (q.v.), those who stand highest are Peter Paul Rubens (q.v.), (1577–1640), Anthony Van Dyck (q.v.), (1599–1641), David Teniers (q.v.) the Younger (1610–90), F. Snyders (1579-1657). The following are the most eminent in the long list of artists of the Dutch school: Rembrandt (q.v.), (1608–69), Vanderhelst (1613–70), Albert Cuyp (q.v.), (1605–91), Terburgh (1608–81), A. V. Ostade (1610–85), J. Ruysdael (q.v.), (1630 or 36—81), Hobbima (1629–70), P. Potter (1625–54), K. du Jarden (1635–78), Jan Steen (q.v.), (1636–89), G. Metzu (1615–58), F. Mieris (1635–81), W. Van de Velde (1633–1707), A. Van der Neer (1613–84), P. Wouvermans (q.v.), (1620–68).

P. has been practiced for a very long period in France; but there, as in Spain and in Britain, the marked preference shown in early times by the sovereigns of the country for the works of foreign artists, their undervaluing native talent, and their directing it into a channel supplied from a foreign source, had the effect of neutralizing it as the exponent of national feeling. Francis I. is acknowledged to have been a patron of art; he had a desire to possess fine works, and he liberally rewarded able artists, but his patronage was almost entirely confined to foreigners. Louis XIV. did what he could to place French art above that of every other nation; but he had no knowledge of it himself; he did not comprehend its nature and true intention, and imagined that pictures if painted by Frenchmen must necessarily be national. Nevertheless, his influence was, on the whole, beneficial to French national art. He always showed himself desirous to employ native rather than foreign talent, and he encouraged and enlarged the Acad. of Fine Arts, founded at the commencement of his reign, under the direction of Lebrun. Although in many respects the principles and the regulations of the Acad. tended rather to the perpetuation of debased Italian, than to the development of genuine French art; yet the bringing together of a body of influential French artists, was the measure most likely to foster the feeling of nationality and to lead to the foundation of a national school of art. In the 16th c., François Clouet was distinguished as portrait-painter; and Jean Cousin as painter, sculptor, and architect. In the 17th c., among many names, those chiefly deserving notice are Simon Vouet, the brothers Le Nain, N. Poussin, Claude Lorraine, Mignard, S. Bourdon, Le Sueur, J. Courtois (called Borgognone), and Coypel. Among these, the works of only the brothers Le Nain possess national feeling and character, and they are held in considerable estimation; those of the others were executed under the influence of foreign art; and excepting Claude's splendid landscapes, Poussin's learned compositions, and some of Borgognone's battle-pieces, hold a low position. The works of Anthony Watteau (1684–1721) are truly national, excellent in execution, and very highly valued. This artist may be classed as at the head of the school of the 18th c.—the period in which art in France became really national. Not only did most of the painters of his school—which lasted till the end of the century, when classic art ruled for a time—form their style on the works of Watteau, but his influence also affected the British school, which arose soon after that of France was developed. Lancret (1690–1742) was the most successful imitator of Watteau; Pater (1696–1736) followed in the same course; Chardin (1699–1779), though influenced by him, had an original style of his own, and his works now stand high. The pictures of Boucher (1704–70) show the defects of the French school of the 18th c., unredeemed by the delicacy and grace, and high technical execution and truth of Watteau, Chardin, and Greuze (1725–1805), the last of whom sustained the character of French national art, and carried it into the 19th c., when it was re-established, after the classic school of David—founded at the Revolution and patronized under the empire of the first Napoleon—had in its turn been laid aside. **David** (q.v.), (1748–1825), leader of this school, carried his admiration of classic art to the length of substituting the study of statues, the works by which the art of the ancients is chiefly known, for that of nature. He had numerous able pupils, several of whom, tired with this constant repetition of conventional form, recurred to nature, extended their range of subjects, and infused new vigor into the French school. Among many distinguished artists that have maintained the fame of the French School during the 19th c. are the following: Géricault, Prud'hon, Leopold Robert, Delaroche (q.v.), Horace Vernet (q.v.), Ary Scheffer (q.v.), Eugène Delacroix (q.v.), and Ingres (q.v.). A number of artists, chiefly pupils of the above, now sustain the high position of French art in every department; while in that of landscape illustrative of French scenery, a branch of art never much studied in past times, great progress has been made, and the rise of this flourishing branch of French art is acknowledged by the French themselves to be due to the works of the English painter Constable, exhibited in Paris 1824.

The English school was the latest national school that arose in Europe, for though the modern schools of Germany and Belgium are of still later date, having arisen in the 19th c., they can be classed scarcely as new schools, but rather as revivals of former national schools. In England, as in France, foreign artists chiefly were in early times employed by the court and the nobles. Henry VIII. competed with Francis I. for the services of the greatest of the Italian artists, and permanently secured those of Hans Holbein, one of the most distinguished of those of Germany. Charles I. liberally patronized Rubens and Van Dyck; and if he had reigned longer, would in all probability, like Louis XIV., have founded a national school. See the separate titles in this work of the artists from other countries who were employed in Britain: see MINIATURE PAINTING, for notice of several eminent British artists in that branch. At the beginning of the 18th c., art in Britain was at the lowest ebb; the career of Sir Godfrey Kneller (q.v.), (1648–1725 or 6), last of the foreigners, was drawing to a close; Sir James Thornhill (1676–1734), an Englishman, followed the decorative kind of art on which Verrio, La Guerre, and others were so much employed; but after his death, that debased style finally went down. The time had arrived for native artists, if there were any entitled to the name, to assert their independence; accordingly, 1734–5, 30 to 40 artists combined together in London, and instituted an academy for studying the human figure. About the same time a similar movement was going on in Edinburgh; the contract or indenture for establishing a school of art, dated 1729, Oct. 18, and signed by 17 artists, besides amateurs, is in the possession of the Royal Scottish Acad. The effort above referred to, of artists combining to found a Life Acad., was due mainly to William Hogarth (1697–1764), who, on this account, and from his first having developed, in a very high degree of excellence in his works, the leading characteristics of the English school, is entitled to be considered its founder. This combination led to these important results—it showed the artists their strength, and enabled them, after a probation of 34 years, to found the Royal Acad., an institution managed by artists, and intended to support and encourge a national school of art. The means by which the Royal Acad. proposed to attain its purpose were the following: 1. By founding a school where artists might learn their profession; 2. By instituting an exhibition where, independently of private patronage and support, artists might bring their works directly before the public. Hogarth died four years before the Royal Acad. was organized; but he powerfully contributed to its establishment by his exertions in bringing the artists together 1734, by supporting the modern exhibitions at Spring Gardens, and by ridiculing by pencil and pen the passion of the cognoscenti of the day for crying up as superior to the modern the doubtful specimens of old art which were largely imported and disposed of at great prices in numerous salesrooms established for the purpose in London. As regards technical execution, and indeed in style generally, the English artists were at first indebted to the French school, which, in the commencement of the 18th c., was in great vigor. Hogarth himself, in these respects, looked closely at the works of Watteau, engravings from which were well known in Britain in his time; indeed, Watteau's pictures were so greatly admired there that he went over and spent the year 1720 painting in London. But Hogarth, though alive to the qualities in art produced by others, ranks among painters as one of the most original, for he greatly extended the dramatic element in painting, and imparted an originality and vigor to it never before attained; and his example has given that element its rank as one of the leading features of the English school, as is exemplified in the works of Wilkie (q.v.), Leslie (q.v.), Stuart Newton, Bonington, and others; and those of many distinguished artists of the present day. In the department of portrait-painting, many of the works of the British school rank with those of Titian, Van Dyck, and Velasquez; e.g., Reynolds's portraits of Nelly O'Brien and Lady Hamilton, Gainsborough's Mrs. Graham and Mrs. Siddons, and some of Raeburn's heads, etc. In landscape, the position of the English school is acknowledged to be very high, its influence now strongly affecting the French school: this is proved by the works of R. Wilson, Gainsborough (q.v.), and Turner (q.v.), the last of whom, for wide range of subject, and rendering of atmospheric effect, stands alone; Constable, whose powerful grasp of nature has excited the emulation of the French artists; Calcott (q.v.), Collins (q.v.), Nasmyth, J. Thomson, Muller, and others; and their successors, the artists of the day, who ably represent the English school. Animal-painting also has been elevated to a high position. And an important department, that of Water-color-painting (q.v.), originated in England, and has there attained higher excellence than elsewhere.

In the United States, the colonial period was, naturally, unprolific in art. Benjamin West (1738–1820) began as a portrait-painter in Philadelphia and New York; but, after his 25th year, made his residence and reputation in England. Some of his subjects are American, e.g., the *Death of Wolfe;* a copy of his *Christ Healing the Sick* was presented by him to Philadelphia; his *Death on the Pale Horse* is well known as most remarkable. John S. Copley (1737–1815) also began here with portraits, and did his best work in England; his famous *Death of Lord Chatham* is of interest to every American. John Trumbull and Charles Gilbert Stuart were the painters of the revolutionary celebrities, and their lives extended far into the 19th c. Trumbull is known widely by engravings of his *Signing of the Declaration of Independence;* many of his works are collected in the Trumbull Gallery of Yale University. Charles Gilbert Stuart (1756–1828), b. R. I., painted in Newport, Boston, and New York, and gained high reputation while 12 years in London; his portrait of Washington is the accepted ideal, and the original, with that of Mrs. Washington, is now in the Boston Athenæum: his coloring, especially of flesh, is unexcelled in modern times. Edward G. Malbone (1777–1807) attained the highest reputation in miniature painting on ivory; he was born in Newport, R. I., settled in Providence and in Boston, worked in a number of cities, and through engravings is known by his group, *The Hours*—three female figures representing the past, present, and future.

Of those who belong to the first part of the 19th c., Washington Allston (1779–1843) was pre-eminent: though a student of the Royal Acad., after his graduation at Harvard, he was independent in the spirit and style of his works, which were severe, chaste, and spiritual when embodying beauty, yet rich in color; his subjects were wide in range, from the head of *Jew* or *Jeremiah*, and *Spalatio's Vision of the Bloody Hand*, to the most delicate conceptions. Among his noted pictures are *The Dead Man Revived* (in the Philadelphia Acad. of Arts), *St. Peter Liberated by the Angel*, *Jacob's Dream*, *The Witch of Endor*, and, in the Boston Athenæum, the unfinished *Belshazzar's Feast*. Rembrandt Peale (1787–1860), of Philadelphia, painted many eminent men, such as the first presidents and commodores; his equestrian figure of Washington is in Independence Hall, Philadelphia. Besides these he produced *genre* pictures, but is most known by his *Court of Death*, reproduced in engravings. John B. White (1781–1859), pupil of West, has been called 'the old American master,' in history and portraits. Thomas Birch (1779–1851) was painter of battles of the war of 1812. The great work of portraying birds by Audubon, and Indians by Catlin, is not to be forgotton. Charles R. Leslie (1794–1859) was educated in Philadelphia, but spent most of his life in England;

his work was masterly: among his paintings, the engraver has made us well acquainted with *Anne Page and Slender*, *Sir Roger de Coverley*, *Uncle Toby and Widow Wadman*, etc. Thomas Sully (1783-1872) came from England at the age of 9, became a portrait painter of mark, characterized especially by grace; his Kembles, father and daughter, and others, are seen in book illustrations; his Queen Victoria (1838) and Lafayette are in Philadelphia; his Commodore Decatur in the City Hall, N. Y.; and his *Washington Crossing the Delaware* is (like Leutze's) familiar as an engraving. John Vanderlyn (1775-1852) was very unequal, but may be regarded as one of the American masters of the figure and color, and comparable to the older masters: his most noted historical subject is *Marius amid the Ruins of Carthage;* his *Ariadne*, and *Venus* (re-sold in New York 1889), are the delight of artists. Samuel F. B. Morse (1791-1872), the inventor, did much to promote art, without attaining very high rank as an artist. John Neagle (1799-1865), son-in-law of Sully, painted portraits of public men; and a noteworthy picture by him, *Patrick Lyon, the Blacksmith*, is in the Boston Athenæum.

By common consent, a new era came in with Thomas Cole (1801-48) about 1825—the era of American landscape art, the excellence of which is recognized throughout the world. His first notable paintings, of autumn scenery on the Hudson, excited incredulity as well as admiration, in England. The faithfulness and vigor of his mountain and forest scenes are remarkable; the *Tornado in an American Forest*, or copy, is, we believe, in the permanent collection of the National Acad. of Design. He is known best, however, by his large allegorical paintings, *The Voyage of Life*, *The Course of Empire*, and *The Cross and the World*, all which prove that a moral didactic purpose is not inconsistent with poetic imagination and artistic beauty. Contemporary with Cole, but known in excellent portraiture, may be named the following: Chester Harding (1792-1866), who had distinguished and even royal sitters, and whose Daniel Webster belongs to the Bar Assoc. of New York; Thomas Doughty (1793-1856) in landscapes of high rank; Charles C. Ingham (1796-1863), remarked for delicacy of finish in portraits and for pleasing fancy figures; Henry Inman (1802-46) very successful in all branches of the easel art, and having much place in permanent collections; William Page (1811-88), remarkable man and painter, noted especially as a lecturer, and for his wonderful flesh-coloring, going far to justify his belief that he had discovered 'the secret of Titian'; besides heads, he painted some notable historical canvases. Also of this period, should be named Robert W. Weir, b. 1803, prof. of drawing at West Point 1832, an artist in portrait, landscape and *genre*, of which last branch numerous superior works might be instanced. Asher B. Durand, b. 1796, left engraving for painting about 1835, and was pres. of the National Acad. 1845-61; he was the Bryant of American landscapists — showing the same profound sympathy with, and simple majestic expression of, the grandeur of forest and all wild nature, together with thoroughness of work; some of his earlier works were of another class, presenting Harvey Birch, Peter Stuyvesant, and Andre. Of the same period, John G. Chapman was noted for drawing and design.

Since the middle of the 19th c. there has been little aspiration toward 'high art,' and in fact little attempt beyond cabinet pictures and sketches. Size of canvas is not a measure of the greatness of the painting; but to some careful observers the pictorial art in this country, like poetry, seems degenerating into tricks of imitative *technique*, and into snatches of incident or scene. While this is the field of the mediocre, the wonder is that no men of power and thoroughness arise who do their best on great themes. Lack of patronage in America is the excuse made, and it was true in the early days of West, Copley, Leslie, when wealth and culture were small. None the less, large prices were paid not long since for the time-consuming works of Church and Bierstadt; enormous sums have been given by our citizens for Meissoniers, Rosa Bonheurs, and Makoffskies, as well as for monuments, edifices, charities; and now the very costly works of Verestchagin have been bought for sale in this country: every day, mere picture fanciers, who are much like poultry-fanciers, pay liberally for little nothings by noted French artists. A Daubigny landscape of muddy greenish yellow, ridiculed in France by Gautier (the famous critic) as made up of feathers, smoke, and minced wool, is bought by our collectors, who pass by Amer. landscapes of infinitely greater worth. It must be, then, a deference of money to the foreign, and in part a deference of artists to the craze for foreign scrappy effects. Frank B. Carpenter has spent years not in vain on his just finished *Arbitration*—the high joint-commissioners on the Alabama claims; and his *Emancipation Proclamation* found a generous purchaser. We need an infusion of the profound earnestness now manifested in Russian art and thought.

Along in the 'fifties' and since there were (some of them still living and working) in history or in *genre*, Daniel Huntington (twice pres. Nat. Acad.) thoroughly good; his pupil Henry Peters Gray, superior and individual in idea, tone, and modelling; James C. Freeman, very artistic and suggestive; Thomas Rossiter, given especially to Scriptural and patriotic subjects; Emanuel Leutze, full of vigor and Düsseldorfian in manner; Edwin White, historical and effective; Elihu Vedder, ideal and original; Peter F. Rothermel, historical and faithful; George C. Lambdin, *genre*, and painter of children; George H. Yewell, excelling in grand interiors; F. W. Edmunds and Mount, clever in rustic scenes and incidents; Eastman Johnson, of rare merit in homely scenes, and lately exhibiting some remarkable portraits; Tompkins H. Matteson, painter of *The Spirit of* '76, now in the Marblehead, Mass., town hall; and James W. Glass, in portrait and history. In landscape, it is enough to mention Frederic E. Church, magnificent; George Inness, Sr., unequal, but in some pictures is priceless; Albert Bierstadt and Thomas Moran, daring and truthful in Rocky Mt. subjects; John F. Kensett, close and untiring student of nature; Richard W. Hubbard, of well-balanced ability; William Hart, rich in tint effects, and his brother, James M. Hart, successful in cattle and landscape; Jervis McEntee, poetic translator of twilights and Novembers; Alexander H. Wyant, admirable painter of the wilderness; John R. Tilton, high in European praise; George L. Brown, unequal but often very fine; Vincent Colyer, well portraying the wild west; Gignoux, who nobly rendered all seasons, and Niagara; Whittredge, free and true; Christopher P. Cranch and T. Buchanan Read, poets, and poetic with the brush; Jasper F. Cropsey, unequal, but excellent at his best; William L. Sonntag, of rough force; Alfred T. Bricher, always equal to his subject; the three satisfactory Gays; Samuel L. Gerry, the same; Albert F. Bellows, delightful especially in water-color; Sandford R. Gifford, who was ranked first in his latter years by many artists; and R. Swain Gifford, of long and just reputation. Of the older brotherhood, still alive and active, are John W. Casilear and John B. Bristol: there is nothing in the annual exhibitions that is sweeter, completer, more rich and harmonious than Casilear's contributions—nothing more eloquent of space, distance and atmosphere than Bristol's. Of the same generation, Paul Weber, H. D. Kruseman Van Elten, Martin J. Heade, Louis R. Mignot, David Johnson, Boutelle, Suydam, Darrah, etc., live in many works. In marine painting, America falls behind no country; it is sufficient to name William F. De Haas and Maurice F. H. De Haas, Edward Moran, William Bradford, Charles T. Dix, William T. Richards (his pieces full of light, tender color, and motion), Walter F. Lansil, W. B. Norton, and William S. Haseltine. In portraiture, recent times show nothing better than the work of Elliott, Baker, Huntington; and, with various phases of merit, Ames, Hunt, Hicks, Healy, Wenzler, Le Clear, Stone, Flagg, Greene, Thayer, Carpenter, Fuller, Gray, Alexander, Hoyt, Pope, Brackett, Joseph O. Eaton, Lawrie, Rowse, Guy, Mooney, Fassett, Cephas G. Thompson, Sellstedt, etc.; also in miniatures, Cummings, Staigg, Shumway, Wagner, Miss Freeman, and J. H. Brown. Animal painters, some of them superior, have not been lacking, such as James H. Beard and William H. Beard, Tait, Peter Moran, Hinckley, Hays, Butler, Rogers, Shurtleff, Abbott H. Thayer, Trotter, Frederick S. Church (subordinate to his poetic compositions), and, mostly of game and still-life, W. Sidney Mount, Brackett, and Cafferty.

Of the *genre* painters who came to the front in the 'sixties,' should be named Winslow Homer, strong in characterization; Eugene Benson, of many excellencies;

Joseph G. Brown, realistic; Ehninger, superior in drawing; Hennessey (also landscapist); George H. Hall, notable colorist (also fruit-painter); Scott and Forbes, war scenes; also, Enoch W. and I. Perry, Rosenthal, Story, Wilmarth, Carter, James W. Champney, Gould, Henry, and S. Frost Johnson; also La Farge in ideal compositions, and David D. Neal in high art. In landscape, then becoming known, Samuel Colman's oriental and Brevoort's English and Amer. scenes, and Quartley's landscapes and marines, can scarcely be overpraised; others of merit were Dyer, Key, etc., and, including fruit and flowers, Andrew J. H. Way, Fidelia Bridges and Mrs. Eliza Greatorex. The limits of this notice exclude the many newer artists, whose names and works are now prominently before the public, and leave no room for mention of our water-colorists and the great progress that they have made since the first exhibition, 1867, of the Amer. Water-color Soc., originated by Samuel Colman, William Hart, William Craig, and Gilbert Burling. For the same reason, no account can be given of the frescoes of Francis Lathrop, and the late lamented William M. Hunt, nor of the great service to Amer. art by its most capable teachers.

A general survey of P. at the present time exhibits the following aspect and arrangement: 1. A school in Germany, which arose during the 19th c., ostensibly a revival of the old national, but truly modelled on the early Italian school, the religious element being prominent. Its principal works are mural, of large dimension, and mostly in fresco, or on a kind of fresco lately invented, called silica or water-glass painting, from a vehicle of that kind being used (see GLASS, soluble). Invention, composition, grouping, and powerful and correct drawing, characterize the modern German works; but being of necessity executed from cartoons, they are deficient in that amount of individual expression, and natural color and effect, that can be attained only by a direct and continued reference to the object represented. 2. A Belgian school, which arose in the 19th c., and is also a revival of the earlier national schools. Some of the Belgian artists lean to the manner of the very early Flemish school, others to that of which Rubens was the head. The greater portion of the Belgian works are easel-pictures, and many rank high for individual expression, color, and technical execution. 3. A French school, exhibiting in active operation the various styles that have at different periods prevailed in that country, sometimes modified or adapted to the taste and feeling of the times. The works of the French school of the 18th c. were utterly condemned by French artists at the close of the 18th and commencement of the 19th c. They would tolerate nothing but what they called classic art. *L'École classique*, as it was styled, was in its turn supplanted by *l'École romantique*. Now, however, all styles are tolerated, even those of foreign schools—for instance, the English school of landscape; and there can be no doubt that, by the extensive range of subject, invention, drawing, and other high qualities which the French artists display in their works, they have now raised that school to a very high position. 4. A British school, which has been in existence as a national school nearly as long as that of France, undisturbed by the convulsions that affected it. Vitality in art is maintained by close reference to nature, and this has all along been the leading characteristic of the English school; while the tendency of the artists at present is, accepting the aid of science in the discovery of photography, to study nature with still greater earnestness and care. The high claims of the British school, long denied abroad, are now fully admitted. Formerly, foreigners never classed a British school among those of Europe, but now this is invariably done. One of the most popular writers on art in France, Théophile Gautier, in his work, *Les Beaux-Arts en Europe*, divides the art of the world into four strongly defined zones—viz., Great Britain, Belgium, Germany, and France—Britain being distinguished by 'individuality,' a potent element in art; Belgium, by 'skill;' Germany, by 'ideality;' and France, by 'eclecticism,' or a selection and combination of the qualities of all other schools.

Regarding technical modes or processes of P., see FRESCO: ENCAUSTIC: MINIATURE. The period when the method of mixing colors with oil was introduced, and the artists to whom the invention is attributed, have been alluded to. The following are some details touching the mechanical processes in oil-painting, the most prominent branch of the art; and the practice of cleaning and restoring pictures.

The implements used by a painter in oil are charcoal, chalk, or lead pencils, for drawing the outline; hair-pencils or brushes of various sizes, made of hog's bristles or finer hair, such as sable; a knife or spatula to mix the colors, and a palette or small tablet of thin wood, to be held in the left hand, on which the colors and tints are placed and mixed; also an easel or stand for supporting the picture, and a light rod for steadying or resting the hand on. Large pictures are always executed on canvas, stretched tightly on a frame, and primed or coated with paint. Small pictures are often painted on boards or panels, generally of hard wood, such as oak or mahogany, and similarly primed or prepared; but canvas, even for small works, seems now generally preferred. Panels are apt to twist, or warp, or split, and in the event of the surface of a picture chipping or breaking off from the ground, the damage can be more easily remedied, and its progress stopped, when the picture is on canvas, by relining. The color of the ground of the canvas or panel has been the subject of much diversity of opinion among artists in different countries and at various periods; and it is certainly of great importance, as it affects the general color of the work, or makes it necessary for the artist to adopt a peculiar style of working. The color of the ground used by the early masters was white, or nearly pure white. This arose from tempera or size being the medium first used in painting, and a pure white ground prepared with size was necessary for that kind of work. This practice, except as regards the Venetian school, continued till the decline of Italian art. Dull red was the universal color adopted in the eclectic, Naturalisti, and late Italian schools, and this is one of the causes of the works of these schools being characterized by blackness and heaviness; at the same time, it is certain that red grounds were also used by many of the best Venetian painters, in whose works these defects are never found, probably from having used an impasto or body of color sufficiently powerful to bear out on the ground. A dark ground affords a facility for working expeditiously; and this, probably, was the principal cause for its being adopted. The Dutch and Flemish painters generally used light grounds; some of them light-brown, nearly the color of oak. Van Dyck occasionally used gray, and sometimes, when he painted in Italy, dull-red grounds. In the British school, light grounds are preferred. Some artists use smooth canvas, others prefer it rough, and avail themselves of the texture to increase the richness of the surface of their work. All these varieties in the materials are called for by the numerous styles or modes adopted by painters in oil colors. Every artist has his peculiar way of working, and in bringing out the color or effect, or special quality in his picture, by which the feeling or idea of the subject he conceives is expressed. No two artists—imitators and copiers are not referred to—produce their tints by mixing colors in the same proportions, nor, indeed, by using the same colors; and it is difficult to lay down general rules for the execution of works, as it depends very much on individual feeling and appreciation. The design or drawing is first outlined on the canvas, if it is light, with charcoal, or with white chalk when it is dark, and these lines are easily dusted off or rubbed out when corrections are made. It is then put in with black chalk or a lead pencil. Not many years ago it was the practice of painters, particularly landscape-painters—Nasmyth, for instance—to rub in the design with some brown color, such as a tint composed of burned sienna and black; but this is not usual now. Some artists make but a slight outline, and paint—or, as it is called technically, rub—in the subject in a bold, rough manner, afterward gradually finishing it up; others draw the design very carefully, and work the picture up in portions, finishing or nearly finishing one portion before commencing another. In arranging the colors, or as it is called, setting the palette, many artists use a great variety of colors, others produce rich tones with few colors; some mix tints in various gradations, others place the colors on the palette, commencing at the outer edge with white, followed by yellows and burned sienna (a reddish brown), then reds, including lakes, such as pink, madder, next blue, and lastly black, and merely mix up the tint on the centre of the palette with their brush, as they proceed. See PAINTS. In laying the colors on the canvas, the painter with his brush mixes or dilutes them with what is called a vehicle or medium. Here, again, the practice of artists is very varied; and this is a matter of importance, as the tone and quality of the picture, as regards texture or surface and transparency, is much affected by the medium employed, and the manner of using it. The durability of the work also depends very much on the medium and the artist's management of it. A medium composed of mastic varnish and drying or boiled linseed oil, named magilp, is that most generally used. This mixture coagulates or forms a jelly, and has the advantage, when placed on the palette, of not running off it, or mixing with the colors when the palette is not held level. Some painters prefer using raw linseed oil mixed with a dryer, such as litharge, or drying oil mixed with turpentine, or copal varnish and turpentine, or copal varnish and oil, with mastic varnish added, to make it coagulate. Other ingredients are often mixed with the medium, to give a thick consistency to the paint, such as fat or thickened nut oil, paste, etc.; and various preparations sold by artists' colormen are much used; for instance, Roberson's medium, and Siccatif de Harlem, a preparation imported from Paris. The mode of using the medium is of great consequence; some apply it very sparingly, others, particularly those who prefer magilp, or a medium that coagulates, employ it lavishly. By the first method, firmness and decision of touch may be exhibited, by the latter, richness and brilliancy of tone; the excess tends to produce, in one case, a hard and dry surface, and the want of the protection that varnish mixed with the color gives against atmospheric action; the other induces a surface having a horny appearance, and a tendency to darken, or crack, or open.

Arresting the decay of pictures, and repairing, or, as it is styled, restoring them, after they have suffered from age or bad usage are matters which engage much attention. Many paintings of immense importance have been saved by the care and skill of those who have earnestly applied themselves to that kind of work; but picture-cleaning is now a trade followed in numerous instances by ignorant pretenders and quacks, who hold out that they possess some means by which they can freshen a picture, and restore it to its original state. Generally speaking, the great extent of this business, is owing to the credulity of those who dabble in collecting old pictures, one great incentive being the hope of picking up, or discovering, some picture of great value concealed under the dirt and discoloration acquired in a long course of years; but, nevertheless, there can be no doubt that many proprietors of works of art who collect from far higher motives, are remarkably prone to call in the picture-cleaner when his services are anything but necessary or beneficial. The late Sir Edwin Landseer, R.A., when examined by the select committee of the house of commons appointed to inquire into allegations of damage by cleaning, sustained by the pictures in the National Gallery of London (Report and Evidence ordered to be printed 1858), stated in the following terms, his idea of this rage for picture-cleaning, or rather picture-destroying: 'The first thing, whenever a picture is sold, I think, is, that it goes to a picture-restorer, or a picture-liner, or a picture-cleaner, no matter what its condition is. It is exactly the same thing as when you buy a horse; your groom says he will be all right when he has a dose of physic through him, whether he wants it or not.' The mania for picture-cleaning prevails with even more ruinous consequences in Italy, where there is a large traffic in old, and few commissions for modern works, and where in many of the public galleries one or more picture-cleaners, for whom work must be found, are attached as permanent officers.

The process of picture-cleaning, or the removal of the old varnishes or other incrustations by which a painting may be obscured, is effected either by mechanical or chemical means. The first method is accomplished when the varnish on the surface is mastic, by rubbing with the fingers the surface of varnish when in a dry state, by which action it is brought off in a fine white powder; or by scraping or erasing the surface with sharp steel instruments when the surface of the picture is approximately smooth. The first of these processes is the best that can be employed; but when the surface is rough or unequal, the prominent portions are apt to be over-rubbed; erasing or scraping is often practiced in Italy, less frequently in other countries. The chemical means consist in the application of solvents, chiefly alkali, or alcohol, to dissolve the old varnish. The danger here is, that the action of these solvents may be not always stopped with sufficient promptness and dexterity, and part of the surface of the picture may be taken off: indeed by this latter process most destruction is caused. For the various methods of picture-cleaning, consult the Report and Minutes of Evidence, above referred to, and *Lejeune's Guide*.

See *History of Painting, Ancient, Early Christian, and Mediæval*, from the German of Woltmann and Woermann, edited by Sidney Colvin (1880); *Classic Painting* by Poynter and Head (1880); and the standard works of Vasari (Florence 1568); Borghini (Florence 1584); Rodolphi (Venice 1648); Zanetti (Venice 1771); Lanzi (1792), Bohn's edition of Roscoe's translation; Von Rumohr (Berlin 1827); Kugler's *Hand-book of Painting, Italian Schools* (ed. by Eastlake 1855), *German, Flemish, and Dutch Schools* (1846) *Spanish and French Schools* (1848); *History of Painting in Italy*, by Crowe and Cavalcaselle (1876); *Hand-book for Young Painters*, by C. R. Leslie, *R.A.* (1855); Ruskin's *Modern Painters* (1843–1860).

PAINTING.

Water-color pictures require for the best effect a roughish drawing-paper; it is stretched and fastened on a smooth board after dampening with sponge, and, after drying, slightly redampened with large brush here and there while painting, by which means smooth tints can be spread evenly, and any touches softened. Gradation, as from the top of the sky downward, is secured by rapidly floated bands of plentiful thin color, more and more diluted, quickly blended at junction, on damp paper. Certain effects are produced by a comparatively dry brush touched in color and lightly struck or dragged. Erasures of any shape or size are made by wetting and giving one hard rub with cloth. Good practice is sketching from nature in masses of light, shade, and color, without much attempt at detail, except by suggestion. Colors are the same, either in cakes or liquid, as those ground with oil in oil P.—For oils, canvas can be prepared on sized cloth with white lead and a spatula; but it is much better to buy. Sketching-paper can be had, or the student can smoothly treat thin pasteboard with house paint. 'Academy board' is thick, and, for pictures no larger than half its regular size, is a good substitute for canvas on stretcher. The brushes to be used most are the bristle, of various sizes, especially the flat-shaped; a fine pointed sable in delicate details; a long fine one, about 1 in., holding much color, for lines, such as twigs and long grasses; and a broad badger 'blender,' for softening parts of the painting—e.g., certain reflections in water, or any part that needs blending. Too much use of sable brushes gives petty effect, and is not so well adapted as bristle to the greater or less blur of distance, beyond immediate foreground. Very many tube colors are supplied by dealers, and an experienced artist may find use for many. Still there are good artists who use but few, such as flake white; Naples and cadmium yellow, with sparing use of chrome; the raw and burnt umbers and siennas; scarlet vermilion and Indian red; rose madder; cobalt blue, ultramarine (which has an atmospheric quality in mixtures), and Prussian blue to make very dark compounds. By some, black is wholly discarded in landscape itself; in continued drying, it comes out strong and spoils tints. Caledonian brown gives a happy effect, mixed with white and blue, for distances. Megilp, having the appearance of jelly, is employed to some extent, to give body to thin colors, to lend a 'pulpy' effect—e.g., to foliage—and to assist drying. Different artists have very different methods of procedure in what are to be finished pictures, not mere sketches. Some first color the whole ground-portion with ochre or sienna, to give an after mellow effect, and even roughly paint in a sketch in reddish or yellowish browns. Some bring on the whole picture by successive stages of definiteness. Others finish as they proceed, for the most part, repainting or retouching as need may be. A general rule is to begin the sky at its upper part, and lighten it downward, without depending much on the 'blender' brush. Another method is to put on bands of increasing depth of azure upward, and thoroughly blend, which may give the sky less of palpitating vitality, but makes surer and quicker gradation. In general, working and mixing colors overmuch detracts from their luminous purity. For clear sky, take cobalt, white, and a little vermilion and Naples yellow (since azure is not absolute blue), adding more Naples yellow toward the horizon—a yellow that happily gives no greenish tinge, unless in excess. For the general color of ordinary clouds, mix more red with the sky color, producing a gray; and the same, in varying proportions, for extreme land or sea distance. Observation will readily teach that, while distance converts all masses into smoky grayish blue, yet the most sunlighted objects show something of their real color, though exceedingly delicate when very remote. Both forms and colors become more and more distinct in approaching the foreground; and effect of atmosphere and distance depends on careful study of these gradations. Even a tree, house, or man, a few hundred yards away, must show its composing masses rather than hard outlines. In the moderately near foreground itself, the style of the tree, not each particular leaf, is the artist's aim. As to color, green is the beginner's usual stumbling-block, especially if he uses much chrome yellow. Even a single bough has almost numberless tints and shades, as it is affected here and there by opacity, transparency, sun, shading, shadow, and reflected color from the sky or otherwise. The ochres, umbers, and lemon and cadmium yellow are useful to form greens, in place of much of the tempting chrome. Trunks and rocks need plenty of paint on the lightest parts, and umber or the like can then be used as a glaze, rubbed off from projections, and left in crevices to give depth. In general, shaded parts of anything should be thinly painted with the dark 'transparent' colors, and lights put on solidly, yet in subservience to the principal high light of the picture. Masses of high light, as on clouds or rocks, are sometimes 'impasted' on with the spatula. Over considerable portions of cloud, land, tree, rock, or water, a rapid process is to paint a ground-work of the observable medium color, and then add the darker and lighter patches or points of requisite tints and shades. After a picture is measurably finished, it may be toned here and there by light washes of color, or by stippling and scumbling—that is, striking it with the separated ends of the hairs of a brush with a little color, or rubbing a little on with the finger. Gradation and harmony, and an all-pervading tone suitable to scene, season, and hour, make up much of the charm of landscape. Art is long; and constant observation of nature, and faithful transcripts from it, together with such study of the work of eminent artists as opportunity offers, are the road to success. Nothing is gained by attention to the odd, capricious, forced pictures of egotistic artists who seek to compel attention and win the plaudits of a clique by mannerism and exaggerated effects.

Portrait P. is most difficult of attainment in its excellence. Contour, pose, character, expression, and a true, vital, luminous coloring, with the peculiar qualities of flesh, under all its modifications, usually demand long, special study and practice, even by those who have the necessary special aptitude. No brief summary of method could be of practical use.—Among manuals, there is the brief one in the primer series published by Winsor & Newton, London, including one on Landscape and another on Water-color, to be had at art-stores.

PAINT'ING, HOUSE: one of the useful arts, including much that is artistic. The primary object of painting houses, or parts of them, either internally or externally, is to preserve them from decay—to cover the parts liable to suffer from exposure with a durable composition. The paint now used is made of ground white lead mixed with linseed oil. This produces white paint, the basis of all others. The various colors given to it are produced by the grinding of pigments (or *stainers*) with the white lead. The commonest of these are ochres (yellow and red earths), lamp-black, Venetian red, umber, Prussian blue, chrome, vermilion, etc. Substances called driers also are mixed with the paint, e.g., spirits of turpentine, boiled oil, litharge and sugar of lead ground in oil. Paint may be laid on any material—stone, wood, iron, and plaster being the most usual in buildings. It has the effect of preserving these, by filling up the pores in them, and forming a coating on which the moisture of the atmosphere does not act. The paint is laid on in several *coats* or layers, each being allowed to dry before the next is applied. The usual number of coats for new wood or plaster varies from three to six. Five coats form a good and lasting protection from the weather. Plain painting is generally finished with a coat prepared with a mixture of oil of turpentine, which takes off the gloss from the paint, and leaves the surface quite *mat* or dead. This is called *flatting*. A very common form of decoration in all ages has been to imitate the veins or colors of marbles, and the *grains* or marks of growth of various woods. In modern times, these arts form a separate branch of house-painting, some men being *grainers*, others *marblers*, etc. The mode in which these imitations are produced is by forming a *grounding* of several coats of plain paint—usually four—and applying the coloring coat over this. In marbling, the coloring matter is marked and veined with *feathers*, in place of brushes; and in graining, steel combs are used. When the surface is dry, it is protected with one or more coats of copal varnish.—See PAINTS.

Besides painting, the decorator uses size-coloring also, the coloring matter in this case being mixed with strong Size (q.v.), instead of oil; but this has the disadvantage of being easily acted on by moisture. It is often used for ceilings of common rooms, and for walls of kitchens and servants' apartments, being much cheaper than oil-paint. In ancient Greece and Rome, wax was used for mixing the colors with; but though there are many very fine specimens of Roman paintings still preserved on the walls of the houses of Pompeii, the mode in which these decorations were applied is not now known.

PAINTS, or PAINTERS' COLORS, or PIGMENTS: prepared or unprepared compositions by which wood, stone, and other materials are coated with a preservative surface of oil, mixed with an earthy matter, to give it color and consistency; also the materials used by artists to produce the colored surfaces of their pictures. The art of Painting (q.v.), in its primitive state, consisted merely in applying such natural, mineral, and vegetable colors as were spontaneously yielded, without any vehicle to render them permanent; consequently, they had to be renewed as often as they were rubbed or washed off from the surfaces to which they were applied. The paints now in use are nearly all mixed with a liquid vehicle, and are applied in the liquid state. The mixing materials are varied according to the requirements of the work. Thus, for some kinds of decorative work and for water-color drawings, gum, glue, size, or other adhesive materials, dissolved in water, are employed; while for the painting of buildings, etc., and for oil-paintings, oils of various kinds are used for mixing and thinning the colors.—See PAINTING, HOUSE. Thus, for painted work exposed to the weather, it is found that linseed oil boiled with the sulphates of lead (litharge) or zinc, or with acetate of lead (sugar of lead), is the best. The preparation of boiled oil requires particular care, as it is desirable to have it bright and clear. Hence the proportions of the metallic salts are much varied by different manufacturers, and some add various other ingredients. The time of boiling, and the method of filtering, also are much varied. For indoor work, plain linseed oil and oil (spirit) of turpentine are used; if a *glossy surface* is wished, the linseed oil must be in excess; if a *dull* or *flattened surface*, then the quantity of turpentine, or *turps*, as it is often technically called, must be increased; and it is usual to add a small quantity of ground litharge and sugar of lead, which are prepared for this purpose, and sold under the name of *Driers*. For artists' colors, very fine linseed or nut oil is used, unboiled, and in small quantity, and turpentine is employed to dilute them. Paints for very rough purposes, such as ship-work, stone walls, etc., are often mixed with whale oil boiled with white vitriol (acetate of zinc), litharge, and vinegar; and they are diluted with common linseed oil and turpentine.

Most of the paints for ordinary purposes are composed first of the coloring matter, then of a quantity of white lead, with which and the oil they are worked into a paste of the shade required, and afterward thinned down with oil and turpentine when used. The white lead which thus forms the basis of most paints, and by itself a color, is a carbonate and oxide of the metal, produced by exposing pieces of lead to the action of the steam of acetic acid, in beds of fermenting tan. It is the principal white paint used, but is liable to discoloration from the gases contained in impure atmospheres. Other white pigments are prepared from the oxide of zinc, and the carbonate and sulphate of barytes. Pale yellow is made with chromate of strontia, orange-yellow with sulphuret of cadmium, while several varieties of this color are produced by chromate of lead, sulphuret of arsenic, or king's yellow, and various native earths in which silica and alumina are combined with oxide of iron. Among these are Yellow Ochre, Oxford, Roman, Stone, Orange, Indian, and American Ochres. *Reds* are either purely mineral, or they are *lakes*, i.e., organic colors precipitated on alumina bases. Of the latter, there are madder-lakes, prepared from madder-roots, and carmine-lakes, prepared from cochineal; of the former, vermilion (bisulphuret of mercury), Indian red (a native oxide of iron), Venetian red (also an oxide of iron), red lead (red oxide of lead, or *minium*). A very beautiful red is used by artists, called palladium red; it is formed of ammonio-perchloride of palladium. *Blues* consist of the artificial ultramarine, and, for artists' purposes, of the real ultramarine, also the silicate of cobalt, and, for water-colors, indigo and Prussian blue. *Greens* are either produced by mixtures of *yellows* and *blues*, or they are made directly from the phosphates, carbonates, acetates, and arsenites of copper, also from the sesquioxide of chromium and from *terre verte*, a native mineral, consisting of iron, silica, potassa, and magnesia. The last two are the best for artists. *Browns* are numerous, and various in their composition. Decomposed peat, burned madder, burned Prussian blue, burned terre verte, asphalt, manganese brown, catechu, umber (an oxide of iron with manganese), and mummy, or the asphalt mixed with other matters taken from Egyptian mummies, are among the best known and most used. *Blacks* are made of Lamp-black and Bone-black (q.v.), peroxide of manganese, and blue-black, which is made of the charcoal of burned vine twigs.

In all cases, the coloring materials of paints require to be very finely ground; and as many are very poisonous, great care is required in their preparation, and several forms of mill have been invented to protect the operator from the poisonous dust and exhalations, and to reduce the coloring material, if ground dry, to an impalpable powder, or, if mixed with the oil, to a perfectly smooth paste.

PAIR, n. *pār* [F. *paire*, a pair—from L. *par*, equal: Sp. *par;* It. *pare*, equal, alike]: two of a sort; a couple; two articles or parts, usually joined together, necessary to make a complete whole, as trousers, drawers, shoes, sheets, and the like; a man and his wife; a brace: V. to couple; to suit; to assort together in twos, as being similar or adapted to each other; to unite in couples; to be joined in couples. PAIR'ING, imp. PAIRED, pp. *pārd.* TO PAIR OFF, to separate from a company in pairs; in *Parliament*, applied to two members of opposite political opinions, when they agree to absent themselves from divisions of the house, for a specified time, in order to neutralize each other's votes; the term is similarly applied to electors, etc., of opposite views who agree mutually to refrain from voting. PAIRING OFF, imp. PAIRED OFF, pp. PAIRING-TIME, the season when birds couple. *Note.*—In OE. and provincial, *pair* was applied to any number of like or equal things, as 'a pair of cards' = a pack of cards; 'a pair of stairs' = a flight of stairs—see Skeat.

PAIRING (or PARING) **MEAL** [Scot.—see WHEAT]: the meal obtained from the wheat by *paring off* the surface of the grains after the bran has been taken off.

PAISIELLO, *pī-ze-ĕl'lo* (or PAESIELLO, *pâ-â-ze-ĕl'lo*), GIOVANNI: eminent musician: 1741, May 9—1815, June 5; son of a veterinary surgeon at Taranto, Italy. He received his musical education in the Conservatorio St. Onofrio at Naples. Of his earlier operas produced at Naples, the most celebrated was *Dal Finto al Vero*, 1777. Some of his best works, particularly the delightful *Il Barbiere di Seviglia*, were written during an eight years' residence at St. Petersburg. At Vienna, he composed 12 symphonies for a large orchestra, and the opera buffa, *Il Re Teodoro.* 1785–99 he produced a number of operas for the Neapolitan theatre, and was appointed by Ferdinand IV. his *maestro di capella.* In consequence of having accepted, under the revolutionary govt., the office of national director of music, he was suspended from his functions for two years after the re-establishment of royalty, but eventually restored to them. In 1802 he went to Paris to direct the music of the consular chapel; but the indifferent reception shortly afterward given to his opera of *Proserpine* led him to return to Naples, where he died. His compositions are characterized by sweetness and gracefulness of melody, and simplicity of structure. The best of his operas would probably not hold the public attention to-day. The libretto of *Il Barbiere di Seviglia* was set to other music by Rossini, whose brilliancy meets the present popular taste, while P.'s opera is forgotten. Besides about 90 operas, P. composed masses, requiems, cantatas, an oratorio, instrumental quartets, harpsichord sonatas, concertos, and a highly praised funeral march in honor of Gen. Hoche.

PAISLEY, *pāz'lĭ:* municipal and parliamentary burgh, and important manufacturing town of Scotland, county of Renfrew; on both banks of the White Cart, three m. above its junction with the Clyde; seven m. w.s.w. of Glasgow by railway, 17 m. e.s.e. of Greenock. The progress of the town has been hindered by the fact that it was bankrupt nearly 30 years. A bill was passed 1872 by which a settlement was effected, and the town property restored to the corporation. Since then, extensive improvements have been made. An abundant supply of water is brought from the Gleniffer Hills, and recently from Rowbank.

By far the most interesting edifice is the abbey. It was founded by Walter, High Steward of Scotland, about 1163, for a prior and 13 monks of the Cluniac order of reformed Benedictines, and was dedicated to St. James, St. Mirren, and St. Milburga. It was the burying-place of the Stuarts before the accession of that family to the throne, and was occasionally used by them afterward as a place of sepulture. It was raised to the rank of an abbey 1245. It was burned by the English 1307, and was mostly destroyed 1561. The building is in the First Pointed style. The nave, of six bays, still used as the Abbey Parish Church, was carefully and thoroughly restored by the removal of unsightly galleries, etc., 1862: it is one of the finest specimens of ancient Scottish ecclesiastical architecture. The choir and transepts are in ruins. Near the abbey is a monument to Wilson the ornithologist, who, like John Wilson (Christopher North) and Tannahill, was a native of Paisley. Other edifices are the county buildings and prison, a quadrangular pile in the castellated style; the Neilson Educational Institution, a noble bequest, in the form of a Greek cross, and surmounted by a fine dome; infirmary; school of design; and various banks. The grammar school was founded by King James VI., and the present building was completed 1864. In 1870 a free public library and museum was presented to the town, and is maintained by the community under the Free Libraries Act; and by a similar liberality was added a pleasure-ground named the Fountain Gardens. In 1873 a native of Paisley bequeathed £20,000 for erection of a town hall, which was completed 1880; it is a handsome classical building near the abbey. A large public park was presented to the town, and opened 1877; and an observatory was presented 1882. P. possesses a trust for the education of boys, the revenue of which amounts to £500.

In the beginning of the 18th c., the principal manufactures were coarse linens and checkered cloths. About the middle of that century, the weaving of linen and of silk gauze became the staple manufactures. In 1784 silk gauze was manufactured to the value of £350,000, and employed 5,000 looms. Shawls, which used to be a principal and are still an important article of manufacture, began to be made here in the beginning of the 19th c. Within recent years, the annual value of the shawl trade of P. was estimated at about £1,000,000 sterling, but it has now greatly declined. Cotton thread is manufactured on a most extensive scale; indeed, P. may be considered the seat of the thread manufacture for the British and American markets. Different varieties of tartan cloths, handkerchiefs, carpets, etc., are made; soap, starch, and corn-flour are largely manufactured; dyeing is carried on by several firms on an extensive scale; and power-loom factories, print-works, machine-shops, bleach-fields, ship-building yards, etc., are in operation in the town and vicinity. At the St. James's Day Fair, horse-races, originated by act of the bailies of the burgh in 1608, are held. Pop. (1871) 48,257; (1881) 55,642.

PAIXHANS GUN, *păks'anz:* smooth-bore cannon of large calibre (usually 23–28 centimetres), and 10 calibres length, with conical chamber, designed originally for firing, from aboard ship, at low elevation, and with strong powder charges, shells against the sides of vessels and shore fortifications. It was invented 1822 by Gen. (then maj.) Henri Joseph Paixhans, of the French army, or, rather, it was an adaptation by him of the principle of the gun known as 'Columbiad,' invented by an American officer, Col. Bomford. It had its first public and official test in the harbor of Brest 1824, with results so satisfactory that it was forthwith introduced into the French navy, and soon was adopted by all the maritime powers of Europe. Its first employment in actual warfare was at the siege of Antwerp by the French 1832, when it fully justified the favorable opinion regarding it. Its efficiency was again demonstrated during the Crimean war, when at Sinope the Turkish fleet was destroyed by the Russian shells 1853. It is now an obsolete weapon, having been suspended by the different types of rifled cannon.

PAJOK, n. *păi'ŏk:* see under PATCH 2.

PAKS, *pŏksh:* market-town of Hungary, county of Tolna; 60 m. s.s.e. of Pesth, on the Danube. The river is here very winding, and the eastern bank a desert and useless morass. The town is subject to frequent inundations. Pop. 11,100.

PAL, n. *păl* [perhaps connected with Gael. *peall*, a horse, a faithful companion]: in *slang*, a partner; an accomplice; a female companion; a doxy.

PALACE, n. *păl'ās* [F. *palais*, a palace—from L. *Palătĭŭm*, one of the hills on which Rome was built, and on which stood the residence of Augustus]: magnificent house in which a sovereign or a great person resides; any splendid building; in Britain denoting usually the residence of a royal personage, or of a lord bishop; in Italy, the United States, etc., applied more generally; in *Scrip.* and *OE.*, a storeplace or cabinet. PALACE-COURT, a court formerly having jurisdiction over a circuit of twelve miles around Whitehall. PALACE-YARD, the open space within or around a palace. *Note.*—The leader of a body of Greeks who, in anc. times, migrated from Greece and settled in Italy, built a fortress and called it *Pallantion*, after his son *Pallas*—hence the Romans, by dropping an *l* and *n*, called the seats of princes *palatia*—see Foster on Accent, p. 48. The Palatine Hill is also said to have been named after *Pales*, a pastoral deity—see Skeat and Müller.

PALACKY, *pâ-lâts'kē*, FRANTISEK: Bohemian philologist, critic, and historian: 1798, June 14—1876, May; b. Hodslavitz, in Moravia. He studied philology and history at Presburg and Vienna; 1831 was appointed historiographer to the states of Bohemia. In the compilation of a general history of Bohemia, he searched libraries and archives in Bohemia, and in Germany and Italy. In the political agitation of 1848, P. was the leader of the

Slav or national party, as opposed to the German. His great work is *History of Bohemia* (in German and Bohemian, Prague 1836–67, 5 vols.): it has high repute for conscientiousness, thoroughness, and accuracy. Among his many other works is one on the most ancient monuments of the Czech tongue; and 1872 his 'Political Testament.' 'Father P.,' as he was fondly called, though himself a Prot., was regarded by Rom. Catholics generally with perfect confidence. He persistently but vainly opposed the reconstruction of Austria on a German-Hungarian basis; and when 1861 he was elected into the Austrian house of lords, he declined to attend.

PALADIN, n. *păl'ă-dĭn* [F. *paladin*—from It. *paladino*—from L. *palatinus*, imperial: term originally derived from the Counts Palatine, or of the Palace (see Palatine), the dignitaries at the Byzantine palace or court]: lord or chieftain. The knights of the round table were the *paladins* of Arthur or Charlemagne, whence 'a brave warrior;' in the Italian romantic poets, a knight-errant.

PALÆ-, prefix: see Pale-.

PALÆOGRAPHY, etc.: see **Paleography, etc.**

PALÆOLOGUS, *pā-le-ŏl'o-gŭs:* illustrious Byzantine family, which appears in history first about the 11th c., and attained imperial dignity in the person of Michael VIII. 1260. This emperor successfully undertook many expeditions to Greece and the Archipelago, and used in vain his utmost endeavors to heal the schism between the Roman and Greek churches.—His successor on the throne was his son Andronicus II. (reigned 1282–1329), under whose reign the Turks commenced in earnest a series of assaults on the Byzantine dominions. Andronicus attempted to oppose them with a force composed of mercenaries, but with small success, as these troops, with perfect impartiality, attacked both his enemies and his subjects. To pay them he was compelled to levy such imposts as nearly destroyed Byzantine commerce. He associated his son, Michael IX., with himself in the government, and was dethroned by his grandson, Andronicus III. (reigned 1328–41), an able warrior and wise ruler, who repeatedly defeated the Bulgarians, Tartars of the Golden Horde, and the Servians, and diminished the oppressive imposts of the previous reign. He was, however, unsuccessful against the Catalans in Greece, and the Turks during his reign ravaged Thrace as far as the Balkans. He was greatly esteemed by his subjects, and merited the title 'Father of his Country,' which they bestowed.—His son, John VI. (reigned 1355–91), a weak and voluptuous prince, attemped in vain both by force and bribery to stop the progress of the Turks; at last the pope, moved by his urgent entreaties, backed by a promise to submit the Greek Church to the pope's supremacy, urged the Hungarians and Servians to arm in defense of the Greek emperor; but the result was only an additional triumph to Sultan Amurath. The imbecile emperor was several times deposed, and, on his final reinstatement by the sultan, acknowledged himself as his vassal for the capital and a small tract along the Propontis and Black Sea. Indeed, so degraded had the Byzantines become, that they obeyed the Sultan Bajazet's summons to aid him in reducing Philadelphia, the last Greek stronghold in Asia Minor.—His son, ANDRONICUS IV. (reigned 1355–73), who had been associated with him in the government, died in exile.—MANUEL II. (reigned 1391–1425) pursued the same tactics as his father, John VI., and with the same result. The allied army of the Hungarians, Germans, and French, which he had summoned to his aid against the Turks, was totally routed at Nicopolis by Bajazet, and Constantinople itself closely besieged. The invasion of Asia Minor by Timur, however, compelled the sultan to withdraw his whole force; and his subsequent defeat and capture at Angora 1402, and the contests among his sons for the supremacy, gave the Greek empire a breathing space. Having aided Mohammed I. in his contests with his brothers, Manuel was, by the grateful sultan, presented with some districts in Greece, Thessalonica, and on the Euxine.—JOHN VII. (reigned 1425–49), being pressed by the Turks, again held out to the pope the old bait of the union of the Greek and Western churches under his sway, and even presented himself at the Council of Florence, where, 1439, July, the union of the churches was agreed to. But on his return to Constantinople, the opposition of the Greek ecclesiastics to the union, supported by the people, rendered the agreement of Florence a dead letter. The pope, however, saw that it was for his interest to fulfil his part of the agreement, and accordingly stirred up Wladislas of Hungary to attack the Turks (see JAGELLONS); but this only hastened the downfall of the Palæologi.—John's brother, CONSTANTINE XIII. (reigned 1449–53), heroic scion of a degenerate race, accepted the crown after much hesitation, knowing his total inability to withstand the Turks, and even then took the precaution of obtaining the sultan's consent before he exercised the imperial authority; but some rebellions in Caramania, baffling Sultan Mohammed II.'s efforts to quell them, the emperor was willingly persuaded by his rash advisers that the time had now arrived for rendering himself independent of the Turks. The attempt brought swifter destruction on the wretched remnant of the Byzantine empire, for Mohammed invested the capital by sea and land, and after a siege, 1453, Apr. 6—May 29, Constantinople was taken by storm, and the last of the Palæologi fell fighting bravely in the breach.—A branch of this family ruled Montferrat in Italy from 1306, but became extinct 1533. The Palæologi were connected by marriage with the ruling families of Hungary, Servia, and the last of the family married Ivan, Czar of Russia—a fact which the czars of Russia have persisted till lately in bringing forward as a claim in favor of their pretensions to the possession of European Turkey. It is said that direct descendants of the Palæologi are living at the present day in France. (For further information, see articles on some of the Byzantine emperors: also, Byzantine Empire.)

PALÆONTOLOGY, etc.: see Paleontology, etc.

PALÆSTRA: see Palestra.

PALAFOX Y MELZI, *pâ-lâ-fōch′ e mĕl′the*, Don José De, Duke of Saragossa: Spanish patriot: 1780–1847, Feb. 15; of a distinguished Aragonese family. He accompanied Ferdinand VII. to Bayonne, and, on seeing him made a prisoner there, fled to Saragossa, where he exerted himself to prevent the invasion of Aragon by the French. His defense of Saragossa (q.v.), 1808, July 27—1809, Feb. 21, which yielded to the French after a second investment, is one of the most brilliant and heroic incidents in modern history, and has conferred lasting glory on P. and the whole city. The ancient fame of the Spaniards for obstinate valor in the defense of walled cities was rivalled, if not surpassed, and Saragossa could proudly claim to vie with Numantia. P., sick and exhausted, was taken prisoner and conveyed by the ungenerous French to the dungeons of Vincennes, where he was treated with great hardship. Released 1813, he returned to Spain, and was appointed in the following year capt.gen. of Aragon. P. was no great politician, but he loved liberty and hated anarchy, and on more than one occasion he crushed the latter. After being created Duke of Saragossa, and Grandee of Spain of the first class, 1836, he kept himself apart from politics. He died at Madrid.

PALAGONITE, n. *păl-ăg′ŏ-nīt* [from *Palagonia*, in Sicily]: a peculiar rock-product of a yellowish-brown color, occurring near modern volcanoes.

PALAIS ROYAL, *pâ-lā′ rwâ-yâl′:* heterogeneous mass of buildings on the e. side of the Rue Richelieu in Paris; composed of a palace, theatres, public gardens, bazaars, shops, cafés, and restaurants. The old palace was built between 1624 and 36, on the site of the Hôtel Rambouillet, by Cardinal Richelieu, who at his death bequeathed it to Louis XIII. Henrietta of France, widow of Charles I., and Anne of Austria, queen mother, afterward lived in it for a time, with the latter's young son, Louis XIV. It subsequently became the town residence of the Orleans branch of the Bourbons, and during the minority of Louis XV. it acquired scandalous notoriety as the scene of the wild orgies in which the regent, Duke of Orleans, and his dissolute partizans were wont to indulge; and in the time of the duke's son, Philippe Égalité, it became the focus of revolutionary intrigue, and the rendezvous for political demagogues of every shade of opinion. This prince, partly to repair his impoverished fortunes, and partly to persuade the sans-culottes of Paris of the sincerity of his professed sympathy with their striving for equality, converted part of his gardens into a place of public resort, and the pavilions of the great court into bazaars, which were divided into shops and stalls. On the downfall of Égalité, the P. R. was taken possession of by the republican govt., and used for the sittings of the tribunes during the Reign of Terror. On the restoration of the Bourbons, it reverted to the Orleans family, and was occupied by Louis Philippe till his election to the throne of France 1830, when it was incorporated in the general domains of the state, and ceased to be an appanage of the House of Orleans. The palace was sacked by the mob during the revolution of 1848, when many of its best paintings and most precious works of art were destroyed. After having been temporarily appropriated to various public purposes, it was thoroughly repaired and magnificently furnished, and given by Emperor Louis Napoleon 1855 to his uncle, Jerome Bonaparte, whose son, Prince Napoleon, resided there until 1871. The main entrance, with its elegant façade, is in the Rue St. Honoré; and on passing through the first court, the second or Cour Royale is reached, to the left of which stands the Théâtre Français, while immediately facing it is the celebrated Galerie Vitrée, or Glass Gallery, which contains on the ground floor some of the most brilliant shops of Paris, while the upper stories are occupied chiefly by cafés and restaurants. The garden, surrounded by this and other galleries, measures 700 ft. by 300. The Red Republicans set fire to the palace 1871, Mar. (see PARIS), when all the apartments occupied by Prince Napoleon were destroyed. The firemen and those who aided them, while forming into line to pass buckets of water, were fired upon by the insurgents; but kept to their work, and succeeded in checking the flames before they spread to the galleries and shops, which may be said to have remained almost intact. In the autumn of 1873 that part of the palace injured by the insurgents was restored. The garden, with its avenues and parterres, fountains and grass plats, still constitutes one of the liveliest and most frequented spots in the whole city; and though much of their glory has faded, its cafés still maintain, in great measure, the world-wide reputation of long ago.

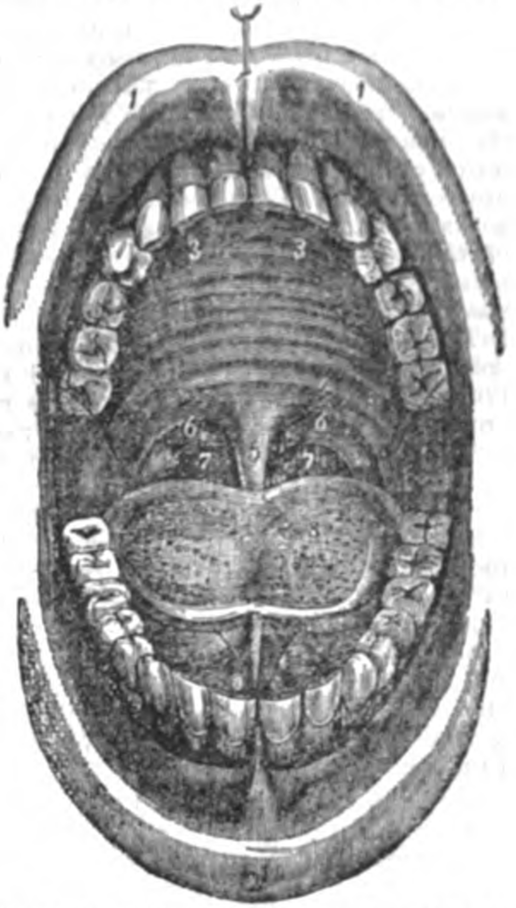
PALAMEDES, *păl-a-mē′dēz:* a prince and hero of Grecian mythology. He was sent to call Ulysses to assist some of the Grecian princes in war, proved that the insanity of the former was feigned, and compelled him to join the expedition, but thereby incurred his lasting enmity. By means of a buried treasure and a forged letter, Ulysses contrived to ruin P., who was convicted of attempting to betray the army to the enemy, and was stoned to death.

PALANQUIN, n., or **PALANKEEN**, n. *păl′ăng-kēn′* (Indian name *Palki*), [F. *palanquin;* Port. *palanquim*—from Hind. *palang*, a bed, a bedstead]: vehicle, usually for one person, commonly used in Hindustan and in China by travellers; a wooden box, about 8 ft. long, 4 ft. wide, and 4 ft. high, with wooden shutters which can be opened or shut at pleasure, and constructed like Venetian blinds for the purpose of admitting fresh air, while excluding the scorching rays of the sun and the heavy showers of rain common in that country. The furniture of the interior consists of a cocoa mattress, well stuffed, and covered with morocco leather, on which the traveller reclines; two small bolsters are placed under his head, and one under his thighs, to render his position as comfortable as possible. At the upper end is a shelf and drawer, and at the sides are nettings of larger dimensions than the ordinary pockets in carriages, for containing articles necessary to the traveller during his journey. At each end of the P., on the outside, two iron rings are fixed, and the *hammals*, or palanquin-bearers, of whom there are four, two at each end, support the P. by a pole passing through these rings and resting on their shoulders. Travelling in this mode is continued by day and night. (See DAWK.) The P. is used also at the present day in Brazil, with the prominent exception of Rio Janeiro. Similar modes of travelling have been at various times in use in w. Europe, but only for short distances. The Roman 'litter,' the French 'chaise à porteur,' and the 'sedan-chair' were the forms most in use, and the two latter were in general use in towns till they were superseded by hackney coaches. The Roman 'litter' was one of the criteria of its owner's wealth, the rich man generally exhibiting the prosperous condition of his affairs by the multitude of the bearers and other attendants accompanying him.

PALAPTERYX, n. *pă-lăp′tėr-ĭks* [Gr. *palaios*, ancient; *a*, without; *pterux*, a wing]: genus of great fossil birds whose remains are found in the river-silt deposits of New Zealand, associated with the gigantic Dinornis; and which, like it, resembled, in the form of the sternum and the structure of the pelvis and legs, the living wingless apteryx. Two species have been described.

PALATE, n. *păl′ăt* [OF. *palat*—from L. *palātum*, the palate or roof of the mouth: It. *palato*]: upper part or roof of the mouth (see below): the organ of taste; taste or relish: intellectual taste: in *bot.*, the projecting portion of the under lip of personate flowers. **PALATABLE**, a. *păl′ă-tă-bl*, pleasant to the taste; savory. **PAL′ATABLY**, ad. *-blĭ*. **PAL′ATABLENESS**, n. *-tă-bl-nĕs*, the quality of being agreeable to the taste. **PALATAL**, a. *păl′ă-tăl*, uttered or formed by aid of the palate; pertaining to the palate: N. a letter pronounced by the aid of the palate. **PALATINE**, a. *-tīne*, pertaining to the palate.

PAL'ATE, The: the upper part or roof of the mouth; consisting of two portions, the hard palate in front and the soft palate behind. The framework of the *hard palate* is formed by the palate process of the superior maxillary bone, and by the horizontal process of the palate bone, and is bounded in front and at the sides by the alveolar arches and gums; posteriorly it is continuous with the soft palate. It is covered by a dense structure formed by the periosteum and mucous membrane of the mouth, which are closely adherent. Along the middle line is a linear ridge or raphe, on either side of which the mucous membrane is thick, pale, and corrugated, while behind it is thin, of a darker tint, and smooth. This membrane is covered with scaly epithelium, and is furnished with numerous follicles (the palatal glands). The *soft palate* is a movable fold of mucous membrane inclosing muscular fibres, and suspended from the posterior border of the hard palate, to form an incomplete septum between the mouth and the pharynx; its sides being blended with the pharynx, while its



The Mouth widely opened, so as to show the Palate:
1, 1, the upper, and 2, the lower, lip; 3, 3, the hard palate; 4, 4, the soft palate; 5, the uvula; 6, 6, the arches of the soft palate; 7, 7, the tonsils; 8, the tongue.

lower border is free. When occupying its usual position (i.e., when the muscular fibres contained in it are relaxed), its anterior surface is concave; and when its muscles are called into action, as in swallowing a morsel of food, it is raised and made tense, and the food is thus prevented from passing into the posterior nares, and is at the same time directed obliquely backward and downward into the pharynx.

Hanging from the middle of its lower border is a small conical pendulous process, the *uvula;* and passing outward from the uvula on each side are two curved folds of mucous membrane containing muscular fibres, and called the *arches* or *pillars of the soft palate.* The *anterior pillar* is continued downward to the side of the base of the tongue, and is formed by the projection of the palato-glossus muscle. The *posterior pillar* is larger than the anterior, and runs downward and backward to the side of the pharynx. The anterior and posterior pillars are closely united above, but are separated below by an angular interval, in which the *tonsil* of either side is lodged. The tonsils (*amygdalæ*) are glandular organs of rounded form, which vary considerably in size in different individuals. They are composed of an assemblage of mucous follicles, which secrete a thick grayish matter, and open on the surface of the gland by numerous (12 to 15) orifices.

The space left between the arches of the palate on the two sides is called the *isthmus of the fauces.* It is bounded above by the free margin of the palate, below by the tongue, and on each side by the pillars of the soft palate and tonsils.

As the upper lip may be fissured through imperfect development (in which case it presents the condition known as hare-lip), so also may there be more or less decided fissure of the palate. In the slightest form of this affection, the uvula merely is fissured, while in extreme cases the cleft extends through both the soft and hard palate as far forward as the lips, and is then often combined with hare-lip. When the fissure is considerable, it materially interferes with the acts of sucking and swallowing, and the infant runs great risk of being starved; and if the child grows up, its articulation is painfully indistinct. When the fissure is confined to the soft palate, repeated cauterization of the angle of the fissure has been found sufficient to effect a cure by means of the contraction that follows each burn. As a general rule, however, the child is allowed to reach the age of puberty, when the operation of *staphyloraphy* (or suture of the soft parts) is performed—an operation always difficult, and not always successful. For the method of performing it, see *Practical Surgery* of Fergusson, who has introduced several most important modifications into the old operation.

For acute inflammation of the tonsils, popularly known as QUINSY, see that title.

Chronic enlargement of the tonsils is very frequent in scrofulous children, and is not rare in scrofulous persons of more advanced age, and may give rise to very considerable inconvenience and distress. It may occasion difficulty in swallowing, confused and inarticulate speech, deafness in various degrees from closure of the Eustachian tubes (now often termed *throat deafness*), and noisy and laborious respiration, especially during sleep; and it may even cause death by suffocation, induced by the entanglement of viscid mucus between the enlarged glands. Iodide of iron (especially in the form of Blancard's Pills) and cod-liver oil are the medicines upon whose action most reliance is placed in these cases; while a strong solution of nitrate of silver (a scruple of the salt to an ounce of distilled water), or some preparation of iodine, should be applied once a day to the affected parts. If these measures fail, the tonsils must be more or less removed by the surgeon, either by the knife or scissors, or by a small *guillotine* invented specially for the purpose.

Enlargement or relaxation of the uvula is not uncommon, and gives rise to a constant tickling cough and to expectoration, by the irritation of the larynx which it occasions. If it will not yield to astringent or stimulating gargles, or to the stronger local applications directed for enlarged tonsils, its extremity must be seized with the forceps, and it must be divided through the middle with a pair of long scissors.

PALATIAL, a. *pă-lā'shĭ-ăl* [L. *palātĭŭm*, an imperial abode (see PALACE)]: of the dimensions and beauty of a palace; royal; noble.

PALATINATE, *pa-lăt'ĭ-nāt:* name applied to two German states, united previously to 1620. They were distinguished as the Upper and Lower Palatinate. The Upper or Bavarian P., now forming a circle of the kingdom of Bavaria, was a duchy, and was bounded by Baireuth, Bohemia, Neuburg, Bavaria, and the dist. of Nürnberg; area 2,730 sq. m.; pop. (1807) 283,800. Amberg was the chief city, and the seat of govt. The Lower P., or the Palatinate on the Rhine, had from 3,045 to 3,150 sq. m.; and consisted of the electoral P., the principality of Simmern, the duchy of Zweibrücken, half of the county of Sponheim, and the principalities of Beldenz and Lautern. For area and pop. of the modern provinces of the Upper and Lower P., see BAVARIA.

The counts of the electoral or Rhenish P. were established in the hereditary possession of the territory of that name, and of the lands attached to it, as early as the 11th c. After the death of Herman III., Emperor Friedrich I. assigned the P. to Conrad of Swabia. After Conrad's death, his son-in-law, Duke Henry of Brunswick, came 1196 into possession of these lands; but he, having been outlawed 1215 by Friedrich II., was succeeded by his son, Otto III., Duke of Bavaria. Ludwig II., or the Strong, succeeded Otto III. in the P. 1253, and was in turn succeeded 1294 by Rudolf I., who was banished by his brother, Emperor Ludwig, because he had taken part with Friedrich of Austria. The country was ruled by his three sons. Ruprecht III., who died 1410, was a German emperor. Of his four sons, Ludwig III. received the electoral or Rhenish P.; Johann, the Upper P.; Stephan, Zweibrücken; and Otto, Mosbach. The second and fourth lines soon died out, as also that of Ludwig III., which came to a close 1559, when the possessions of that prince, together with the electorate, passed to Friedrich III. of the Simmern line. He was succeeded by Ludwig IV. 1576, by Friedrich IV. 1583, and by Friedrich V. 1610, who, after he accepted the Bohemian crown, was driven from his possessions by the emperor 1619, and his office of elector was transferred to Maximilian, Duke of Bavaria. Karl Ludwig, son of Friedrich V., received the Lower P. at the peace of Westphalia, and in his favor a new or eighth electorship was created. With his son Karl, the Simmern line terminated 1685, when the P. fell into the hands of Philipp Wilhelm, count palatine of Neuburg.

The House of Neuburg was descended from Ludwig the Black, count palatine in Zweibrücken, second son of Stephan, count palatine in Simmern. Wolfgang, descendant of Ludwig, was the founder of all the other lines of counts palatine. Of his three sons, Johann founded the line of Neu-Zweibrücken; Karl, the Birkenfeld line; Philipp Ludwig, the Neuburg line. Philipp Ludwig had three sons, Wolfgang Wilhelm, August, and Johann Friedrich. The first founded the Neuburg line, the second the Sulzbach line, the third died childless. The son of Wolfgang Wilhelm died 1690. His son, Johann Wilhelm, became heir to the Beldenz line 1694. He was succeeded by his brother, Karl Philipp, who in turn was succeeded 1742 by Karl Theodor, from the Sulzbach line, who united the Bavarian territories with the Palatinate. Duke Maximilian of Zweibrücken next succeeded 1799, who at the peace of Luneville (1801) was compelled to cede a part of the Rhenish P. to France, a part to Baden, a part to Hesse-Darmstadt, and a part to Nassau. Treaties of Paris of 1814 and 15 reassigned the Palatinate lands beyond the Rhine to Germany, Bavaria receiving the largest share, and the remainder being divided between Hesse-Darmstadt and Prussia.

PALATINE, n. *păl'ă-tĭn* [F. *palatin*—from L. *palātīnus*, of or belonging to the imperial abode: It. *palatino*, palatine]: a noble invested with royal privileges: ADJ. pertaining to a palace; possessing royal privileges. PALAT'INATE, n. the province of a palatine (see below). COUNTY PALATINE, a county over which a noble or bishop had received sovereign jurisdiction.—A *Palatine* (*Comes Palatinus* or Count Palatine) was, under the Merovingian kings of France, a high judicial officer, who had supreme authority in all causes that came under immediate cognizance of the sovereign. After the time of Charlemagne, a similar title was given to any powerful feudal lord to whom a province, generally near the frontier, was made over with *jura regalia*, or judicial powers, similar to what the counts palatine had received in the palace; and the district so governed was called a *palatinate* or *county palatine*. There were three counties palatine in England—Lancaster, Chester, and Durham—which were, no doubt, made separate regalities on account of their respective proximity to the frontier of Wales and to that turbulent Northumbrian province which could not be accounted a portion of either England or Scotland. In virtue of their regal rights, the counts palatine had their courts of law, appointed their judges and law officers, and could pardon treasons, murders, and felonies; all writs and judicial process proceeded in their names, and the king's writs were of no avail within the bounds of the palatinate. Lancaster seems to have been made a county palatine by Edward III. Henry, first Duke, and John, second Duke, of Lancaster, both were invested by him with the dignity of count palatine. Henry VI. was hereditarily Duke and Count Palatine of Lancaster, and on his attainder, soon after Edward IV.'s accession, the duchy and county were forfeited to the crown, and confirmed on Edward IV.—afterward on Henry VII. and his heirs forever. The queen is now (1890) Duchess and Countess Palatine of Lancaster. There is still a chancellor of the duchy and county palatine, whose duties are few and unimportant, but the administration of justice has gradually been assimilated to that of the rest of England: see LANCASTER. Chester is supposed to have become a county palatine when made over with regal jurisdiction by William the Conquerer to Hugues d'Avranches. In the reign of Henry III. it was annexed to the crown by letters patent, and, since that time, the earldom palatine of Chester has been vested in the eldest son of the sovereign, or in the crown, whenever there is no Prince of Wales. Durham seems to have become a palatinate first when William the Conqueror constituted Bp. Walcher Bp. and Duke of Durham, with power (according to William of Malmesbury) to restrain the rebellious people with the sword, and reform their morals with his eloquence. The palatinate jurisdiction continued united with the bishopric till 1836, when it was separated by act of parliament, and vested in William IV. and his successors as a franchise, distinct from the crown, together with all forfeitures, mines, and *jura regalia*. It has since been more completely incorporated with the crown. Pembroke was at one time a county palatine, but ceased to be so in Henry VIII.'s time. The abp. of York also exercised the powers of a palatine in the county of Hexham in Northumberland, of which he was deprived in the reign of Elizabeth. In very early times there were a number of similar privileges in Scotland, the most important of which was that of the Earls Palatine of Strathearn. In Germany, the *Pfalzgraf*, or count palatine, exercised a jurisdiction much more extensive than the simple *Graf* or count. See PALATINATE.

PAL′ATINE HILL (*Mons Palatinus*): central hill of the famous seven on which anc. Rome was built, and, according to tradition, the seat of the earliest Roman settlements. In historical interest, it ranks next to the Capitol and the Forum. Its summit is about 160 ft. above sea-level. The form of the hill is irregularly quadrangular. Its n.w. slope, toward the Capitoline Hill and the Tiber, was called *Germalus* or *Cermalus.* The origin of the name is uncertain, though several derivations are given connecting it with legendary stories. Romulus is said to have founded the city upon this hill, and on Germalus grew the sacred fig-tree (near to the Lupercal) under which he and his brother, Remus, were found sucking the she-wolf. Upon the P. H. were the temple of Jupiter *Stator*, the temple of Cybele, the sacred square inclosure called *Roma Quadrata*, and other sacred places and edifices, besides many of the finest houses in Rome. Augustus and Tiberius had their residences here, whence Tacitus termed it *ipsa imperii arx* (the very citadel of government); and at last Nero included it entirely within the precincts of his *aurea domus*, which Vespasian subsequently restricted to the hill. From the time of Alexander Severus, it ceased to be the residence of the emperors; but the name *palace* (*palatium*), derived from it, was given to the abodes of sovereigns and great princes, and has been adopted into modern languages. Recent excavations have brought to light numerous remains of the palatial and other structures with which the P. H. was anciently covered; and these are now among the most interesting sights of 'the eternal city.'

PALATO-, *pă-lā′tō-* [L. *palātum*, the roof of the mouth, or the palate]: a prefix in many medical terms, signifying connection with the palate.

PALAVER, n. *pâ-lâ′vėr* [Port. *palavra;* Sp. *palabra*, a word, discourse, a promise: mid. L. *parabola:* F. *parole, parler*]: in *Africa*, a public deliberation or conference; superfluous or idle talk: V. to deceive by words; to humbug; to talk one over. PALA′VERING, imp.: N. idle, superfluous talk. PALA′VERED, pp. *-vėrd.*

PALAWAN, *pâ-lâ-wân′*, or PARAGUA, *pâ-râ′gwâ:* one of the Philippine Islands (q.v.).

PALAY, *pa-lā′* (*Cryptostegia grandiflora*): climbing plant of nat. order *Asclepiadaceæ* (q.v.), common in many parts of India, particularly on the e. coast of Hindustan. It yields a very fine strong white fibre, resembling flax, and which can be spun into the finest yarn. The fibre is obtained from the stalk; the milky juice contains caoutchouc.

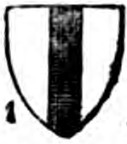
PALAZZOLO ACREIDE, *pâ-lât′so-lo â-krā-ē′dā:* town of Sicily, the province of Syracuse, 29 m. s.s.w. of Catania, on the brow of a hill, overhanging a deep valley. Near P. are remains of the ancient *Acræ*, founded by a colony from Syracuse, on the site of a Phœnician settlement, B.C. 664. The most curious remains are in

some low cliffs beneath the town, to the south, where is a series of arched niches, containing figures carved in high relief in the rock. The style of art appears to be archaic Greek, with somewhat of an Egyptian character. Pop. 9,954.

PALE- [Gr. *palaios*, ancient]: prefix used in many compound words, to signify ancient, of old time.

PALE, a. *pāl* [F. *pâle*, pale, wan—from L. *pallĭdus*, pale, pallid—from L. *pallĕō*, I am pale]: pallid; deficient in color; white of look; of faint lustre; dim; wan; used in many compounds, as *pale-eyed*, *pale-faced*, *pale-looking:* V. to turn pale or wan; to make pale; to become pale. Pal′ing, imp. Paled, pp. *pāld.* Pale′ly, ad. *-lĭ.* Paleness, n. *pāl′nĕs*, the quality or condition of being pale; want of freshness; a sickly whiteness of look. Pal′ish, a. *-ĭsh*, rather pale. Pale ale, a light-colored bitter ale. Pale-faced, having the face wan or white. Pale-hearted, in *OE.*, dispirited; discouraged.

PALE, n. *pāl* [F. *pal* and *palis*, a pale or thick lath—from L. *pālus;* It. *palo*, a pole, a stake: Sp. *palo*, a stick: Ger. *pfahl*, a pile, a stake: W. *palis*, a thin partition of board]: a narrow-pointed piece of board fixed in the ground, or nailed to a rail, or both, used to inclose grounds and parks; that which incloses or fences in; the space inclosed by rails; limits or limited territory; used figuratively, as, within the *pale* of the church; a cheese-scoop; in *her.*, one of the figures known as ordinaries, consisting of a broad perpendicular band in the middle of the shield (see No. 1). Several charges of any kind are said to be 'in pale' when they stand over each other perpendicularly, as do the three lions of England. A shield divided through the middle by a perpendicular line is said to be 'parted per pale.' The Pallet is the diminutive of the pale (see No. 2). When the field is divided into an even number of parts by perpendicular lines, it is called 'paly of' so many pieces (see No. 3).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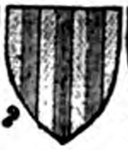
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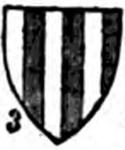
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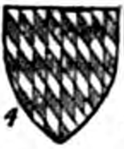
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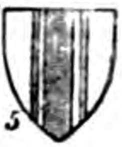
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When divided by lines perpendicular and bendways crossing, it is called 'paly bendy' (see No. 4). An Endorse is a further diminutive of the pallet, and a pale placed between two endorses is said to be endorsed (see No. 5). Pale, v. to inclose. Paling, imp. *pāl′ing*, inclosing with pales: N. a fence or barrier formed with pales; the materials for erecting a fence or barrier of pales. Paled, pp. *pāld:* Adj. striped. English pale (see Pale, English).

PALE, *pāl*, ENGLISH: in Irish history (see **IRELAND**, *History*), that portion of the kingdom over which the English rule and English law was acknowledged. There is much vagueness in the meaning of the term, from the great fluctuations of the English authority in Ireland. The designation dates from the reign of John, who distributed the portion of Ireland then nominally subject to England into 12 counties palatine, Dublin, Meath, Kildare, Louth, Carlow, Kilkenny, Wexford, Waterford, Cork, Kerry, Tipperary, and Limerick. To this entire district, in a general way, was afterward given the designation of the Pale. But as the term is applied by writers of each period to the actual English territory of their period, care must be taken to indicate the period. In a general way, however (not quite exact, but sufficient for most purposes), the Pale may be considered as comprising the counties Dublin, Meath, Carlow, Kilkenny, and Louth.

PALEA, n. plu. *pā'lĕ-ă*, or PALES, n. plu. *pālz* [L. *palĕă*, chaff: F. *paille*]: in *bot.*, a name given to the small scale-plates, like chaff, in the receptacles of some composite flowers; the scalelike parts of the flowers of Grasses (q.v.), within the glume. PALEACEOUS, a. *pā'lĕ-ā'shŭs*, resembling chaff; covered with small membranous scales like chaff. PALEOLÆ, n. plu. *păl'ĕ-ŏ-lē*, in *bot.*, two, rarely three, little scales, situated a little in front of the external palea—also called the *squamulæ*, *glumellulæ*, or *lodiculæ*.

PALEARCTIC REGION, n. *păl-ē-ârk'tĭk:* in *zool.* and *geog.*, one of the six faunal regions into which Sclater's system divides the land of the globe—a very extensive region, comprising all temperate Europe and Asia, from Iceland to Behring's Strait, and from the Azores to Japan. To the s. it includes the extra-tropical part of the Sahara and Arabia, and all Persia, Cabul, and Beloochistan, to the Indus. It comes a little below the upper limit of forests in the Himalayas, and includes the larger n. portion of China, nearly to the coast of Amoy.

PALEASTER, *pā-lē-ăs'tėr* or *păl-ē-* [Gr. ancient star-fish]: genus of star-fish peculiar to the Silurian period, which in general appearance resemble the living brittle stars, but present so many anomalies that they cannot be referred to any existing family.

PAL'EFITS: see LAKE DWELLINGS: CRANNOGS.

PALEMBANG, *pâ-lĕm-bâng′:* formerly an independent kingdom on the e. coast of Sumatra, now a Netherlands residency; bounded n. by Djambi, n.w. by Bencoolen, s. by the Lampong districts, s.e. by the Strait of Banca; 61,900 sq. m. Much of the land is low-lying swamp, covered with a wilderness of impenetrable bush; but in the s. it rises into mountains, of which Oeloe Moesi (Ulu Musi) is 6,180 ft. high. Gold-dust, iron ore, sulphur with arsenic, lignite, and common coal are found; also clays suitable for coarse pottery, etc. Springs of pure oil occur near the coal-fields of Bali Boekit (Bukit), and of mineral water in various places. Rice, cotton, sugar, pepper, tobacco, and, in the interior, cocoa-nuts, are grown; the forests producing gutta-percha, gum elastic, rattans, wax, benzoin, satinwood, etc. The rivers abound with fish; and the elephant, rhinoceros, tiger, panther, and leopard roam the woods, as well as the deer, wild swine, and goats, with many varieties of monkey.

In the dry season the thermometer ranges from 80° to 92° F., and in the rainy season 76° to 80°. The climate is healthful, except in the neighborhood of the swamps. The natives are descended from Javanese, who in the 16th c., or earlier, settled in P., and ruled the whole land. The race, however, has become mixed with other Malays, and the language has lost its purity. In the n.w. interior is a tribe called the Koeboes (Kūbūs), of whose origin nothing is known, but who are probably the remainder of the aborigines. They do not follow agriculture, go about almost naked, and live chiefly by fishing and hunting. They are thought to lack idea of a Supreme Being, though they believe in existence after death. Pop. about 600,000.

PALEMBANG′: town, cap. of the kingdom and residency of P.; 52 m. from the Soensang (Sunsang), or principal mouth of the river Moesi (Musi), in 2° 59′ s. lat. and 104° 44′ e. long. The city is built on both banks of the Moesi, and other streams which fall into it, and is five m. long by half a mile broad. The river is more than 1,000 ft. wide, and 40 to 50 ft. deep, so that the largest vessels can sail up to the city. The native houses are raised on posts, and neatly constructed of planks or bamboos; the Chinese, Arabians, and Europeans chiefly living in floating houses called rakits, of which there are more than 500, and holding communication with one another and with the natives by boats. The fort is built on the left bank of the river, and behind it are an institution for the blind and a splendid mosque. There is a school, where 30 European children are educated, a govt. elementary school for natives, and several good Chinese schools. Many of the natives can read and write, and in 1856 a native printing-press was erected.

P. is visited annually by more than 30,000 boats of various sizes, bringing produce from the interior, consisting chiefly of rice, benzoin, gum elastic, gutta-percha, raw cotton, rattans, tobacco, pepper, wax, dragon's blood, resin; and gold-dust from the boundaries of the kingdom of Djambi, now included in the residency. These are obtained chiefly in exchange for salt, cotton manufactures, earthenware, iron and copper wares, and provisions. The large foreign trade is chiefly with Java, Banca, Singapore, China, and Siam. The imports, considerably exceeding the exports, have average annual value of nearly $1,500,000. The natives of P. are good ivory-carvers, gold and silver smiths, jewellers, cutlers, japanners, painters, boat-builders, bookbinders, etc., and expert at all ordinary handicrafts. The women make cotton fabrics, do spinning and dyeing, and weave silk stuffs embroidered with gold. Pop. 44,000, of whom 100 are Europeans, 3,000 Chinese, and 2,000 Arabians.

PALENCIA, *pâ-lăn'thē-â:* Spanish province, one of the 8 divisions of Old Castile; very irregular in form; bounded n. by Santander, e. by Burgos, s. by Valladolid, and w. by Valladolid and Leon; 3,127 sq. m. The principal rivers are the Pisuerga and the Carrion. With the exception of the n. portion, which has numerous mountains interspersed with fertile valleys, and a large marsh in the s., the province is an elevated table-land nearly destitute of timber. There are several coal mines. Other minerals abound, but are not mined. A railroad passes through the province, one crosses the s.e. portion, and there is an important canal from Alar del Rey to Valladolid. Most of the roads are neglected. Agriculture is the principal occupation, but there are some manufactures, principally of linen and woolen goods. Pop. (1880) about 185,000.

PALEN'CIA (anc. *Pallantia*): city of Spain, in Old Castile, cap. of the modern prov. of P.; in a treeless but well-watered and fruitful plain, on the Carrion, 30 m. n.e. of Valladolid. It is a bishop's see, and is surrounded by old walls, 36 ft. high and 9 ft. thick, around which are pleasant promenades. The cathedral, of the later Spanish Gothic, was built 1321–1504. The first univ. in Castile was built here in the 10th c., but was removed to Salamanca 1239. Nearly one-third of the people are employed in manufacture of blankets and coarse woolen cloths. The position of the town on the Carrion, and on the Castilian Canal, is favorable to commerce. The vine is cultivated, and there is good trade in wool. Pop. (1877) 14,505.

PALENQUE, *pâ-lĕn'kâ*, RUINS OF: on the Rio Chacamas, branch of the river Usumasinta, in the state of Chiapas, Mexico; 8 m. s.e. of the village of Santo Domingo de Palenque; lat. 17° 30′ n., long. 92° 25′ w. The ruins extend over a large area, covered with a dense tropical forest, and are of difficult exploration: they consist of vast artificial terraces, or terraced truncated pyramids, of cut stone, surmounted by edifices of peculiar and solid architecture, also of cut stone, covered with figures in relief, or figures and hieroglyphics in stucco, with remains of brilliant colors. Most of the buildings are of one story, but a few are two, three, and some may have been four stories. The principal structure, known as the Palace, is 228 ft. long, 180 ft. deep, and 25 ft. high, standing on a terraced truncated pyramid of corresponding dimensions. It was faced with cut stone, cemented with mortar of lime and sand, and the front covered with stucco and painted. A corridor runs around the building, opening into four interior courts, which open into many smaller rooms. On slabs of stone are carved numerous colossal figures, and the remains of statues more resemble Grecian than Egyptian or Hindu art. Other spacious and elaborately ornamented buildings appear to have been temples of religion. These ruins were in the same condition when Cortes conquered Mexico as now, overgrown with a forest, and their site forgotten. They were discovered 1750. Three explorations were made by the Spanish govt., but the ruins were little known until visited by Messrs. J. L. Stephens and F. Catherwood, and their account published with plans and drawings. See Stephens's *Incidents of Travel in Central America*, etc., and Catherwood's *Views of Ancient Monuments of Central America*, etc. There are in Mexico dim traditions of the existence, at a remote period, of the capital of a theocratic state, the centre of a long-since extinguished civilization, of which the only traces are these wonderful ruins and unexplained hieroglyphics.

PALEOCOSMIC, a. *pă'lē-ō-kŏs'mĭk* [Gr. *palaios*, ancient; *kosmos*, the world]: a term designating the earliest portion of the prehistoric stone period; same as paleolithic.

PALEOCRYSTIC, a. *pă'lē-ō-krĭs'tĭk* [Gr. *palaios*, ancient; *kruos*, frost]: applied to the perpetually ice-covered region of the Arctic Ocean, around the north pole; applied to both the Arctic and Antarctic seas, as perpetually covered with ice of unknown ages: see ARCTIC OCEAN.

PALEOGEAN, a. *pă'lē-ō-jē'ăn* [Gr. *palaios*, ancient; *gē*, the earth]: pertaining to the former conditions of the earth's surface, as revealed by geology—distinct from the present surface of the globe, as described by geography.

PALEOGRAPHY, or **PALÆOGRAPHY**, *pā-lē-ŏg'râ-fĭ:* study of ancient handwriting from surviving examples: distinguished from Epigraphy in that P. takes cognizance of writings executed with such instruments as a reed (*calamus*) or a style (*stilus*, *graphium*) on papyrus, waxed tablets, parchment, or other substances, which in different ages have fulfilled the uses of paper, while Epigraphy has to do with inscriptions cut in stone, metal, or other enduring materials. Sometimes the term P. is employed in a wider sense, as comprehending the art of reading ancient writings, and such a critical knowledge of all their circumstances as will serve to determine their age, if they happen to be undated, and their genuineness in the absence of any formal authentication. For these purposes the paleographer needs to be acquainted with the various substances, such as bark, leaves, skins, paper, etc., which have been used for writing; with the various manners of writing which have prevailed, and the changes which they have undergone; with the various forms of authenticating writings, such as seals, signets, cachets, signatures, superscriptions, subscriptions, attestations, etc., which have been employed at different times; with the various phases through which the grammar, vocabulary, and orthography of the language of the writing with which he is dealing, has passed; and with more or less, as the case may be, of the history, laws, institutions, literature, and art, of the age and country to which the writing professes to belong.

Of ancient Greek and Roman written documents a certain number have come down to our time; and selections from these as well as from later MSS. are used in this article to illustrate the sort of materials that form the subject-matter of P.; these writings are, so far as the most ancient ones are concerned, on papyrus or on waxed tablets, while the less ancient documents are on vellum or on paper: see PAPER: PAPYRUS: VELLUM. The tablets used by the Greeks and Romans—called by the Greeks *deltoi, deltidia, ptyktoi, pinakes*, and by the Romans, *tabulæ, tabellæ, pugillares, ceræ*, were usually of wood, but sometimes of ivory; they had a raised margin round the edges, and the surfaces were covered with a thin layer of wax—hence the name commonly given to them by the Romans, *ceræ*, plural form of *cera*, wax: the Greek names all mean thin boards, tablets, and *deltos, deltidion*, furthermore indicate one of the original forms of such tablets—that of the Greek letter Δ. The tablets were used for temporary memoranda, and as we use slates: for use in schools they were usually strewn with sand, instead of being covered with wax. Two or more tablets held together by rings or other fastenings which served as hinges, were termed by the Romans *caudex* or *codex* (*block* of wood), or, according to the number of tablets so held together, *ceræ duplices, triplices, quadruplices, quintuplices*, etc. (books of 2, 3, 4, 5 tablets); by the Greeks a two-leaved book of tablets was called *pinax* (or *deltos*) *diptychos*, and one of 3, 4, 5 tablets, *pinax triptychos, tetraptychos, pentaptychos*, and so on.

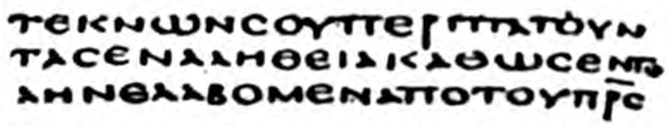
The history of Greek P., so far as it can be written from extant materials, begins with B.C. 3d c., and ends with the close of the 15th c. and the introduction of the art of printing. During that period Greek handwriting is seen to have passed through two phases—that of the uncial or large letter, and that of the minuscule or small letter; the beginning of the 9th c. marks the time of transition, though naturally survivals of the antiquated uncial letters may be noted in documents long subsequent to the year 800, and on the other hand anticipations of the minuscule not a few are seen in MSS. dating from an earlier period Both the uncial and the minuscule are seen in two styles—the set, or more formal, and the cursive. The difference between the capital letters and the uncial is no doubt a result of the difference in the materials upon which the inscriptions were made. When the letter *E* (*epsilon*) was to be carved on stone or bronze, it was manifestly easier to give it that form than the uncial form Є ; the same is to be said of Σ (σ,ς) and *Ω* (ω); but in writing with a style on a waxed tablet, or with a reed or a quill pen (the use of the latter can be traced no farther back than the 6th c.) on papyrus or parchment, the uncial form is the more convenient; and as the transition from capitals to uncials was due to the difference of materials on which the inscription was made, so no doubt the change from uncial to minuscule is, at least in part, due to the general use of vellum and later of cotton and linen paper.

The earliest examples of Greek uncial writing extant have been discovered in Egypt and in the ruins of Herculaneum, and they are on papyrus. Those from Herculaneum are certainly of a date not later than A.D. 79, when the town was destroyed; probably they were all written during that century. Of the papyri from Egypt there are a few whose *downward* date-limit is accurately ascertained. The earliest Greek MSS. extant were discovered at the village of Kurob, Egypt, by Flinders Petrie, of the Univ. of Dublin, 1890. These are of a date certainly prior to B.C. 235, and comprise fragments of classical writings and records of a probate court, some dating from the reign of the 2d Ptolemy, the rest from the reign of the 3d Ptolemy. In the London *Athenæum*, 1890, Oct. 24, Prof. Mahaffy announces as immediately, forthcoming an edition of these papyri, with fac-simile reproductions. Of the handwriting of these documents he says that it 'varies from large, clear, splendid writing to the most fugitive and illegible cursive.' Prior to Petrie's discovery the most ancient Greek MS. document extant was an astronomical work entitled *Εὐδόξου τεχνή*, now in the Louvre collection. This has, written on the back, deeds bearing dates equivalent to B. C. 165 and 164, and hence is certainly as old as the middle of B.C. 2d c. The main MS. is written in a hand intermediate between the formal, or set, and the cursive. In the Louvre collection are also fragments of a work on dialectics, indorsed with a deed of B.C. 160: the writing is in set uncials of simple style, executed with a fine light stroke, without exaggeration of forms in the letters: in these respects it seems a fair type of the writing in vogue during the 2 or 3 centuries preceding the Christian era. In a tomb near Monfalat was found, 1849, a fragmentary papyrus containing portions of the *Iliad:* it dates from not later than B.C. 1st c.; the text is in slender uncials, very regular. The Louvre collection contains also fragments from the *Iliad,* which date from perhaps the 2d c. of our era. A fragment of poetic lines, supposed from the lost *Temenides* of Euripides, together with a few lines from the *Medea,* is in the private library of Firmin-Didot, bibliopole, of Paris, the date of which is not later than B.C. 161, a document of that year having been added. One of the most important discoveries hitherto made of Greek papyri in Egypt is that of one containing 2 orations by Hyperides, now in the Brit. Museum: it is a roll, 11 ft. long, in unusually good preservation. The writing is elegant, in set uncials, which however are often linked together without raising the pen: this document is certainly not more recent than B.C. 1st c. The Herculaneum Greek papyri are usually written in neatly-formed and regularly-spaced uncials.

Of tablets inscribed with Greek uncial writing, very few have come down to us. There are 2 in the British Museum. These are from Memphis, and on one are traced some verses in large, roughly-formed letters, whose date can only be conjectured to fall within the 1st c. of our era. In the Cabinet des Medailles at Paris, is a set of 5 tablets on which are scribbled alphabets; also, in a more current hand, a contractor's accounts. Finally, a tablet from which the wax is worn, has, inscribed upon the wood, characters in ink: it dates probably from the 4th century.

The firmer and smoother surface of vellum favors a more exact style of writing and a firmer hand, but no Greek MS. on vellum of a date earlier than the 4th c. is known to exist. The earliest examples of MSS. on vellum are the 3 famous codices of the Bible, and of these the conjecturally most ancient—the *Codex Vaticanus* (see VATICAN CODEX)—is probably of the 4th c. The writing, in its original condition, must have been very perfect as a specimen of penmanship, but nearly the whole of the text has been traced over by a later hand, probably in the 10th or 11th c., a small number of words only being left untouched. Written in characters of uniform size, without enlarged initial letters, the MS. has all the simplicity of great antiquity. The *Codex Sinaiticus* (see SINAITIC CODEX) bears the same tokens of antiquity, and is by its discoverer, Tischendorf, judged to be older than *Vaticanus:* but the writing of *Sinaiticus* is not so pure as that of *Vaticanus,* and if that is a criterion of age, *Vaticanus* is the older. The *Codex Alexandrinus* (see ALEXANDRIAN CODEX) is referred to the middle of the 5th c.; it has enlarged letters at the beginnings of paragraphs; the writing is more elegant than that of *Sinaiticus.* In all three codices we find simplicity and regularity the leading features; the round letters are formed in symmetrical curves; ϵ, Ϲ, etc., finishing off in a hair-line, thickened at the end into a dot; horizontal lines fine, those of ϵ, *H,* and *Θ,* being either in the middle or high in the letter; the base of *Δ* and the cross-stroke of *Π* also fine, and as a rule, kept within the limits of the letters, and not projecting beyond.

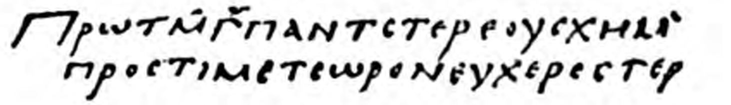
From the 5th c. there have come down to us fragments of an illustrated *Homer*, in which the writing is somewhat taller than in the three codices, the cross-stroke in Є is abnormally low down, the stem of the *P* (rho) is not produced below the line. To the same c. is probably to be referred also the palimpsest *Codex Ephraemi* (q.v.), an incomplete New Test. with the letters imperfectly erased, and homilies of Ephraem Syrus written over them (see PALIMPSEST); the *Octateuch*, whose leaves are divided between Paris, Leyden, and St. Petersburg; the illustrated *Genesis* in the Cottonian Library, and the *Dio Cassius* of the Vatican.



Greek Uncial (Cod. Alex.), 5th century.
(τεκνων σου περιπατουν
τας εν αληθεια καθως εντο
λην ελαβομεν απο του π[ατ]ρ[ο]ς.—2 John 4.)

The uncial writing of the 6th c. shows signs of degeneration in larger characters, more heavily formed, and not so completely written, cross-strokes in such letters as *Α*, *Δ*, *Π*, *Τ*, produced and terminating in heavy points. The *Dioscorides* at Vienna is the type of 6th c. uncial writing. Other MSS. of the 6th c. are a palimpsest *Homer* and palimpsest fragments of *Luke*, with Syriac text written above both; palimpsest fragments of *Matthew* and *Isaiah*, at Dublin; fragments of the Pauline epistles from Mt. Athos; a copy of the Gospels written in silver and gold on purple vellum, the leaves of which are scattered among several libraries; fragments of the *Eusebian Canon;* the Coislin *Octateuch;* and the Vienna *Genesis*.

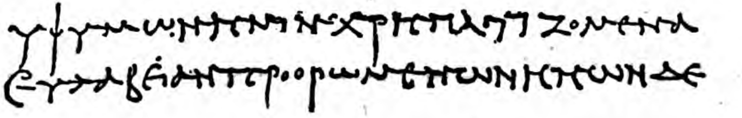
A new style of Greek uncial writing appears in the beginning of the 7th c., round letters becoming oval and the other letters laterally compressed; the writing slopes to the right, and accents and breathings are introduced. The slanting style continued in use through the 8th and 9th c. These characteristics (except the accents and breathings) are seen in the following fac-simile of two lines from a mathematical treatise of the 7th c. In this MS. the abbreviations are numerous.



Greek Uncial (Mathemat. Treatise), 7th century.
(πρωτ[ον] μ[εν] γ[αρ] παντ[ος] στερεον σχημ[ατος]
προς τι μετεωρον εὐχερεστερ—)

A papyrus in the Imperial Library, Vienna, of A.D. 680, bears signatures in slanting uncials; and the same style is seen in other MSS. of the same and of later date. In an 8th c. MS., the Venetian Old Test. codex, are a few lines in round uncials, but in a style so labored as to prove the discontinuance of that form of writing. Toward the end of the 9th or the beginning of the 10th c. the minuscule writing was well established and the uncial was in disuse, except for church-service books. The uncial character having thus become in some degree a 'sacred' form of handwriting, the tendency was at once toward conservatism, i.e., strict retention of the forms once adopted and reversion to antique forms, rather than progress in new directions. In this way the sloping uncials become again more upright and rounder.

The cursive uncial writing is seen in papyri discovered in Egypt, and now deposited in the principal libraries of Europe. Till Flinders Petrie's discovery, the most ancient example of the cursive style known as extant was a collection of documents penned by Ptolemæus, a Greek, who became a recluse devotee in the temple of Serapis at Memphis about B.C. 173. A fairly continuous series of writings exists, illustrating the changes in cursive uncial handwriting for several centuries. For the earlier period the papyri are supplemented by the ostraka, or potsherds, on which in Egypt, under the Roman empire, were written publicans' receipts for payment of taxes, etc. A few waxen tablets also remain to show the style of early Greek cursive writing.

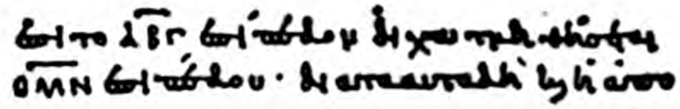


Greek Cursive, 163-162 B.C.
(υφ υμων ημιν χρηματιζομενα
ευλαβειαν προορωμενων ημων δε)

In the above specimen the letters are erect and written with great exactness; in successive centuries they are written with less precision and more sloping. Then, there is more combination of letters, and that necessarily leads to essential changes in the form of the letters themselves, those suffering most change which most readily combine with others. To this class of letters belong the *Α, Ε, Τ, Ρ* (i.e. the Greek character for our R), *Π*, and *Δ*.

The *minuscule* letters were a natural development of the cursive uncials: they are the source of the lower-case Greek characters at present used in print. But in the process of change from uncial cursive to minuscule, there were some curious transformations. For example the three letters *Β, Η, Κ*, which in their uncial as in their capital forms are quite distinct, had, in the early minuscule, shapes not readily distinguishable from one another; and it is worthy of note that our present lower-case Greek characters *β, η, κ*, are descended from uncial rather than from these early minuscule forms.

It is different with other minuscule characters, e.g., *μ, ν, θ, δ, σ, π*, etc., which have undergone very little change since the 9th c. This will appear from the following specimen; which, however, exhibits the letter *η* in a form that has not been perpetuated. It is like the present lower-case *η* turned upside down, but it is, as *η* is not, a legitimate minuscule modification of the capital *H* (the Greek letter *eta*):

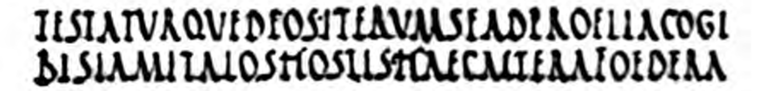


Greek Minuscule (Euclid), 888 A.D.

(επι το ΑΒΓ επιπεδον διχα τμηθήσεται
ΟΜΝ επιπέδου· δια τα αυτα δη κ[αι] ή άπο)

see below in the Pompeian *graffiti* the form of the letter *H*. In this MS. is seen also the disused form of *κ*, and the reader will notice how closely it resembles *η*.

Latin Writing.—No ancient Greek writing in capital letters is extant. The use of capitals for book-writing, if ever it existed among the Greeks, having ceased prior to the date of the most ancient papyri that we possess. It is different with the Latin. Specimens of very ancient Latin writings exist in which the letters all are capital, and there are two styles of ancient Latin capitals—the 'square' and the 'rustic.' The difference between these two is, that in the former the horizontal lines are at right angles with the vertical strokes, as in our own capital types; while in the rustic there is less regularity in that and other respects, as appears from the following specimen. Rustic capitals, being more convenient in shape, were in more general use, and most of the MSS. in capitals which have survived are in this character.

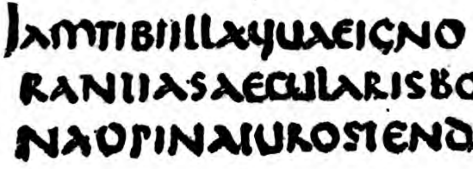


Roman Rustic Capitals (Virgil), 3d or 4th century.

(Testaturque deos iterum se ad proelia cogi
Bis iam Italos hostis haec altera fœdera)

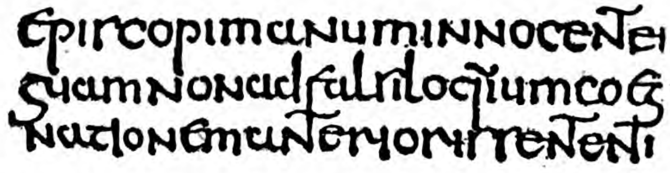
The earliest specimens of the rustic hand extant are the papyrus rolls recovered from the ruins of Herculaneum, which must necessarily date from a time prior to A.D. 79. Vellum MSS. in this hand are executed with great precision. The large scale of the writing and the extensive surface of a costly material covered by it, must have made works written in rustic capitals very high-priced. There are in the Vatican library 2 copies of Virgil written in this style, neither of them probably older than the 3d or 4th c. No MS. in square capitals is extant of date earlier than the end of the 4th c., the oldest being portions of a Virgil, in the Vatican and at Berlin. Next in date, but much more recent, seem to be the Virgilian fragments at St. Gall.

Latin uncial writing differs from the capital in the rounded forms of A, D, E, H, and M, as seen in the accompanying specimen, except that here the bow of the A is in most places 'blind.' Another point of difference is, that in the uncial some of the letters rise above or fall below the line. The earliest specimens extant belong to the 4th c., and in them the writing is so well-established that we may believe it to have been already practiced for generations. Uncial writing persisted as an ordinary book-hand, till in the 8th c. it was supplanted by the reformed small writing of the Carlovingian school. Examples of uncial writing are the Vercelli *Gospels*, a palimpsest Cicero *De Republica* in the Vatican, and a fragment of a commentary on an ante-Hieronymian text of the Scriptures, at Fulda. All of these are of the 4th c. From the 6th c. are the two codices of Livy, at Paris and Vienna, and the *Gaius* at Verona.



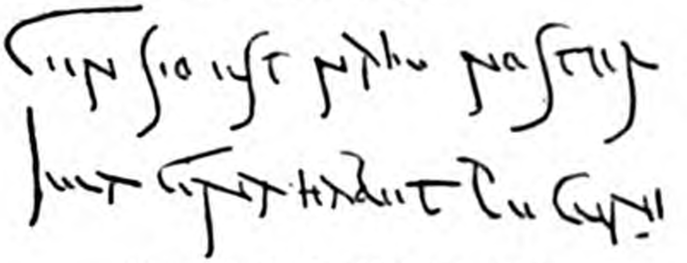
Latin Uncial, 5th or 6th century.
(Iam tibi illa quæ igno
rantia saecularis bo
na opinatur ostenda*m*)

Between uncial and cursive lies the style 'half-uncial.' Apparently as early as the 4th c. a set style of small writing was in use, which partly followed in its formation the characters of Roman cursive writing, while in some of its letters it retained the uncial forms. It appears in marginal notes on some early MSS. But beginning with the end of the 5th c. there is extant a series of MSS. written wholly in this hand. In the specimen here given the B, D, M, N, R, and S are seen to approximate in form to the same letters in Latin minuscule writing. The agreements with uncial are patent.

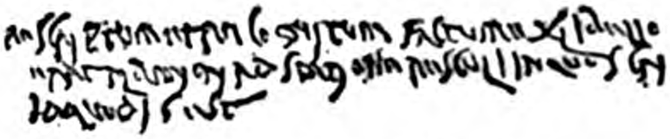


Latin Half-Uncial, 509–510 A.D.
(episcopi manum innocente[m]—
[lin]guam non ad falsiloquium coeg[isti]—
nationem anterioris sententi[æ]—)

Of Roman cursive writing we possess specimens dating from the 1st c. of our era. In a box unearthed, 1875, in the house of L. Cæcilius Jucundus, at Pompeii, were found 27 *libelli* or waxen tablets containing records of various legal transactions; and at different times, 1786–1855, 25 other waxen tablets, some dating from A.D. 131, were found in ancient mines at Verespatak (anc. Alburnus Major, in Dacia). In both sets of tablets the writing is much alike, and the forms of the letters resemble those of the more cursive graffiti found on the walls of Pompeii:



Roman Cursive (Graffiti), 1st century.
(censio est nam noster
magna habet pecuni[am]).

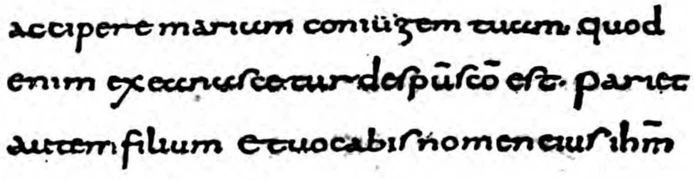


Roman Cursive (Dacian Tablet), 167 A.D.
(descriptum et recognitum factum ex libello—
erat Alb[urno] maiori ad statione Resculi in quo scri—
id quod i[nfra] s[criptum] est)

In this early cursive hand are seen the beginnings of minuscule writing. The slurring of the strokes, whereby the bows of the capital letters were lost and their more exact forms modified, led the way to the gradual development of the small letters. The letter A is formed by a main stroke supporting an oblique cross-stroke above it; so too, P and R, having lost their bows, and F, throwing away its bar, are formed by two strokes placed in relatively the same positions, but varying in their curves. The main stroke of B dwindles to a slight curve, and the two bows are transformed into a bent stroke or loop to the left of the long stroke, so as to resemble our script *d*. This form of B persists in cursive writing till the 6th c. The D resembles the uncial form of that letter; the E is represented by the old form II found in inscriptions and in the Faliscan alphabet. The G in the Dacian tablet shows the first outline of the *g* of later writing; in the graffiti the H, by losing the upper half of its second upright limb, comes near to being the small *h*. In the Pompeian tablets (as also in the graffiti) M has the four-stroke form. In the Dacian tablet it is a rustic capital, almost an uncial M. The O is formed by two strokes almost like *a*.

From the date of the Dacian tablets to the 5th c., no specimens of Roman cursive writing exist. Fragments of two imperial rescripts in cursive writing on papyrus are extant, in which are seen the same characters as in the Dacian tablets, with certain differences and modifications; but they are even more difficult to read than the latter. The same is to be said of another fragment dating from 572.

Roman writing of the different styles—capital, uncial, half-uncial, and cursive—became known to the western nations, and formed the basis of the different national styles of writing, known as the Lombardic, the Visigothic, and the Merovingian. An important influence in determining the ultimate forms of our print and script characters was the reform of writing instituted by Charlemagne 789. The abbey of St. Martin of Tours was the principal centre from which the reformation of the book-hand spread. In the 9th c. the minuscule had attained a degree of elegance and clearness that left little to be desired, as appears from the following specimen:


accipere mariam coniūgem tuam. quod
enim ex ea nascetur de spū scō est. pariet
autem filium et uocabis nomen eius ihm̄

Caroline Minuscules, 9th century.
(accipere mariam coniugem tuam quod
enim ex ea nascetur de sp*irit*u s*anct*o est. **Pariet**
autem filium et uocabis nomen eius Ie*sum*)

From that style to our modern characters, whether script or print, was an easy step.

P. may be said to have been founded by the learned French Benedictine, Jean Mabillon, whose *De Re Diplomatica* (1681, fol ; reprinted 1709 and 89, in 2 vols. fol.) is still, perhaps, the most masterly work on the subject. With the *Nouveau Traité de Diplomatique* (Par. 1750–65, 6 vols. 4to) of the Benedictines of St. Maur, and the *Eléments de Paleographie* (Par. 1838, 2 vols. 4to) by M. Natalis de Wailly, it is the great authority for French paleography. English P. is perhaps less favorably represented in Astle's *Origin and Progress of Writing* (Lond. 1803) than Scottish P. in Anderson's and Ruddiman's *Diplomata Scotiæ* (Edin. 1739). Muratori treats of Italian P. in the third vol of his great work, *Antiquitàtes Italicæ Medii Ævi;* and among later works on the same subject may be mentioned *Diplomatica Pontificia* (Rome, 1841) of Marino Marini. The P. of Greece is illustrated in *Paleographia Græca* (Par. 1708) of Montfaucon. Spanish P. may be studied in *Biblioteca de là Poligrafia Española* (Mad. 1738) of Don C. Rodriguez. Of works on German P. it suffices to name Eckard's *Introductio in Rem Diplomaticam* (Jen. 1742), Heumann's *Commentarii de Re Diplomatica* (Norimb. 1745), Walther's *Lexicon Diplomaticum* (Gött. 1745), and Kopp's *Palæographia Critica* (Manh. 1817). Hebrew P. has been elaborated by Gesenius in *Geschichte der Hebräischen Sprache und Schrift,* and other works. The great work on P. generally —one of the most sumptuous works of its class ever published—is *Paléographie Universelle* (Par. 1839–45, in 5 vols. fol.) of M. J. B. Silvestre.—See **BLACK LETTER: CONTRACTIONS: PALIMPSEST: PAPYRI.**

PALEOLITHIC, a. *pă'lē-ō-lĭth'ĭk* [Gr. *palaios*, ancient; *lithos*, a stone]: term applied to the earliest portion of the prehistoric stone period. PALEOLITHIC AGE: see PALEONTOLOGY: MAN (*Antiquity of*).

PALEOLOGY, n. *pă'lē-ŏl'ō-jĭ* [Gr. *palaios*, ancient; *logos*, discourse]: the science or knowledge of antiquities. PA'LEOL'OGIST, n. *-jĭst*, one versed in.

PALEONISCUS, n. *pă'lē-ō-nĭs'kŭs* [Gr. *palaios*, ancient; Gr. *oniskos;* L. *oniscus*, a millepede]: in *geol.*, genus of fossil fishes belonging to the great ganoid order, with a fusiform body, covered with rhomboid scales, a heterocercal tail, and moderately sized fins, each furnished with an anterior spine. The single dorsal fin is opposite to the interval between the anal and ventral fins. 28 species have been described from the Carboniferous and Permian measures.

Paleoniscus.

PALEONTOGRAPHY, n. *pă'lē-ŏn-tŏg'ră-fĭ* [Gr. *palaios*, ancient; *onta*, beings; *graphō*, I write]: the description of fossil remains. PALEONTOGRAPH'ICAL, a. *-ŏn'tō-grăf'ĭk-al*, relating to the description of fossils.

PALEONTOLOGY, n. *pā′lē-ŏn-tŏl′ŏ-jĭ* [Gr. *palaios*, ancient; *onta*, existing things; *logos*, discourse]: science which treats of fossil plants and animals. **PA′LEONTOLOG′ICAL**, a. *-tō-lŏj′ĭ-kăl*, pertaining to paleontology. **PA′LEONTOL′OGIST**, n. *-tŏl′ŏ-jĭst*, one versed in paleontology.—*Paleontology* is that division of Geology (q.v.) which investigates the evidence of organic life on the globe during the different bygone geological periods, whether this evidence arises from the actual remains of the different plants and animals, or from recognizable records of their existence, such as footprints, Coprolites (q.v.), etc.

The metamorphic action which has so remarkably altered the oldest sedimentary rocks is sufficient to have obliterated all traces of organic remains contained in them. Fossils are consequently extremely rare in these older paleozoic strata; indeed, it is only after long search, and within recent time, that undoubted remains have been found in the Laurentian rocks. Under the title LIMESTONE, reference is made to the existence of beds of limestone as requiring the presence of animal life for their production. Though in 1852 an organic form resembling a coral was found in the limestone of the Ottawa, much doubt was always entertained regarding this solitary discovery. In 1863, however, there was detected an organism in the serpentine limestone of Grenville, of true Laurentian age, which Dr. Dawson describes as that of a Foraminifer, growing in large sessile patches, after the manner of *Carpentaria*, but of much greater dimensions, and presenting minute points, which reveal a structure resembling that of other foraminiferal forms, as, for example, *Calcarina* and *Nummulina*. Large portions of the limestone appear to be composed of these organisms, mixed with other fragments, which suggest comparisons with Crinoids and other calcareous fossils, but which have not yet been distinctly determined. Some of the limestones are more or less colored by carbonaceous matter, exhibiting evidences of organic structure, probably vegetable. In this single Foraminifer and the supposed coral, we have all that is positively known of the earliest inhabitants of our globe, with which we are yet acquainted. That these are but the smallest fraction of the fauna of the period in which they lived is evident from the undetermined fragments associated with them, as well as from the extensive deposits of limestone of the same age. And that, contemporaneous with them, there existed equally numerous representatives of the vegetable kingdom, cannot be doubted, when it is remembered that the animal can obtain its food only through the vegetable, and not directly from inorganic materials. Besides, their remains apparently exist in the limestone at Grenville, a rock which, from its very nature, is usually devoid of vegetable fossils.

The Cambrian rocks, though of immense thickness, have hitherto yielded indications of only a very few animals, but these have special interest, as they are the oldest fossil remains yet detected in Britain. They consist of an impression which Salter considers to be portion of a trilobite, named by him *Palæopyge*, of the burrows and tracks of sea-worms, and of two species of radiated zoophytes called *Oldhamia*—animals which in this case also can be nothing more than the most fragmentary representations of the fauna of the period. No indications of vegetable life have yet been noticed in the Cambrian rocks, for we cannot consider the superficial markings on some of these strata as having anything to do with fuci.

Undoubted representations of the four invertebrate sub-kingdoms early make their appearance in the Silurian strata, and the occurrence before the close of the period of several fish adds to them the remaining sub-kingdom—the vertebrata. If we except the siliceous frustules of Diatomaceæ said to have been detected in these rocks, no satisfactory traces of plants have yet been observed, though extensive layers of anthracitic shales are common. Of the lower forms of the animal kingdom, some sponge-like bodies have been found, and corals are remarkably abundant, belonging chiefly to the order *Rugosa*, a paleozoic type, the members of which have horizontal tabulæ, and vertical plates or septa, either four in number, or a multiple of four. Graptolites, another family of zoophytes, lived in the dark mud of the Silurian seas, and did not survive the period. All the great divisions of the Mollusca are represented by numerous genera, several of which are not very different from some living forms. A few true star-fishes have left their records on the rocks, but the most striking feature in the Echinodermata of the period is the Cystideans, or armless sea-lilies, which, like the Graptolites, did not pass beyond the Silurian seas. Tubes, tracks, and burrows of annelids have been observed, and numerous Crustacea, belonging, except one or two shrimp-like species, to the characteristic paleozoic Trilobite, of which the number of individuals is as remarkable as the variety of species and genera. It is only in the upper portion of the group (the Ludlow beds) that the fish remains have been found: these have been referred to six different genera; *Cephalaspis* is best known.

The rocks of the Old Red Sandstone period supply the earliest satisfactory remains of plants. The Ferns, Sigillariæ, Lycopodites, and Calamites, so abundant in the Coal Measures, make their appearance among the newer of these beds, and even fragments of dicotyledonous wood have been observed. The various sections of the invertebrata are well represented, but the remarkable characteristic in the animal life of the period is the abundance of strange forms of heterocercal-tailed fish, whose buckler-shields, hard scales, or bony spines occur in great abundance in some beds. The reptiles and reptile tracks in the Red Sandstone of Moray, originally referred to the Old Red, are now universally considered as belonging to the New Red measures.

PALEONTOLOGY.

The striking feature in the rocks of the Carboniferous period is the great abundance of plants, the remains of which are found throughout the whole series, the coal-beds being composed entirely of them, the shales being largely charged with them, the sandstones containing a few, and even the limestones not entirely devoid of them. These plants were specially fitted for preservation, the bulk of them being vascular cryptogams, a class which Lindley and Hutton have shown by experiment to be capable of long preservation under water. They are chiefly ferns; some are supposed to have been arborescent lycopods, while others (*Sigillaria*, *Calamites*, and *Asterophyllites*) are so different from anything now known that their position cannot be definitely determined, though it is probably among the higher cryptogams. Several genera of conifers have been established from fossilized fragments of wood; and some singular impressions, which appear like the flowering stems of dicotyledonous plants, have been found. The limestones are composed chiefly of crinoids, corals, and brachiopodous shells. The corals attain great size, and the crinoids are extremely abundant, their remains making sometimes beds of limestone 1,000 ft. thick and hundreds of sq. miles in extent. Many new genera of shells make their appearance. The Trilobites, so abundant in the earlier rocks, are reduced to one or two genera, and finally disappear with this period. Fish with polished bony scales are found; and others, like the Port Jackson shark, with pavements of flat teeth over their mouth and gullet, fitting them to crush and grind the shell-protected animals on which they fed. Strange fish-like reptiles existed in the seas, and air-breathing species have been found on the European continent and in America. The wing-cases and parts of the bodies of insects also have been found.

The Permian period is remarkable for paucity of organic remains, but this may arise from our comparative ignorance of its strata. The plants and animals are on the whole similar to those found in the Carboniferous measures, and a great proportion of them belong to the same genera. Many ancient forms do not pass this period, as the *Sigillaria* among plants, and the *Producta* among animals.

The red sandstones of the Triassic period are noticeably destitute of organic remains—the iron, which has given them their color, seems to have been fatal to animal life. In beds, however, on the continent of Europe, in which the iron is absent, fossils abound. These fossils present a singular contrast to those in the older rocks. The Paleozoic forms had been gradually dying out, and the few that were still found in the Permian strata do not survive that period, while in their place there appear in the Trias many genera which approach more nearly to the living forms. Between the organisms of the Permian and Triassic periods is found a more striking difference than between those of any previous periods. Looking at this life-character, the rocks from the Permian downward have been grouped together under the title Paleozoic; while from the Trias upward the whole of the strata have received the name Neozoic.

The extensive genera of Ammonites and Belemnites make their appearance first in the Trias. Several new forms of Cestraciont fish occur, and the reptiles increase in number and variety; among them is the huge batrachian Labyrinthodon, and the singular fresh-water tortoise Dicynodon. The bird-tracks on the sandstones of the Connecticut valley are by some referred to this age. Small teeth of Mammalia, believed to be those of an insectivorous animal, like the Myrmecobius of Australia, have been found in the keuper beds of Germany and of Somerset, England.

The Oolitic series abounds in organic remains, in striking contrast to the scanty traces in the Permian and Triassic periods. Many new genera of ferns take the place of the Paleozoic forms; and a considerable variety of Conifers make their appearance, some of which have close affinities with living species, one, indeed, being referred to a still existing genus. The same approximation to living types is found in the animal kingdom. Several of the foraminifers are referred to living genera. Among the corals, the representatives of two living families make their appearance. No new genera are found among the Brachiopoda; but the Conchifera and Gasteropoda show a great addition of new genera, some of which are still represented by living species, while not many new genera were added to the Cephalopoda, though they were individually very abundant. In some places the Lias shale consists of extensive pavements of Belemnites and Ammonites. The Crinoids give place to the increasing variety of sea-urchins and star-fishes. Numbers of insects have been found. The Cestracionts continue represented in the Oolitic seas, but with them are associated several true sharks and rays; and the homocercal-tailed fish become numerous. Labyrinthodont reptiles abound: the huge Megalosaur and its companions occupied the land; while the seas were tenanted with the remarkable Ichthyosaur and Plesiosaur, and the air with the immense bat-like Pterodactyle. Seven genera of Mammalia have been found, all believed to be small carnivorous or insectivorous marsupials, except the Stereognathus, which Owen considers to have been a placental mammal, probably hoofed and herbivorous.

In the Cretaceous beds, chiefly deep-sea deposits, the remains of plants and land animals are comparatively rare. The Wealden beds, however, which had fresh-water origin, contain the remains of several small marsupials, some huge carnivorous and herbivorous reptiles, a few fresh-water shells, and some fragments of drift-wood. The true chalk is remarkably abundant in the remains of foraminifers—indeed, in some places it is composed almost entirely of the shells of these minute creatures. Of the Mollusca, the Brachiopoda are in some beds very abundant; the Conchifera introduce several new forms, most striking of which is the genus Hippurites, which with its allies did not survive this period; the cephalopodous genera which appeared in the Oolite abound in the chalk, many new forms being introduced; while others disappear with the period, like the Belemnites and Ammonites. Sea-urchins become still more numerous. In some beds the remains of fish are abundant, and, while cartilaginous species still exist, the bony fishes become more numerous; and among them the family to which the salmon and cod belong makes its appearance. Reptiles are common in the Wealden, and the flying Pterodactyles attained greater size, and were probably more numerous than in the former period. Except the remains of a single bird obtained from the greensand, birds as well as mammals have left no traces that have yet been found in the Cretaceous beds; though doubtless they existed.

In the Tertiary strata, the genera are either those still living, or forms very closely allied to them, which can be separated only by careful examination of the accurate scientific observer. The plants of the Eocene beds are represented by dicotyledonous leaves, and palm and other fruits. Foraminifers are remarkably abundant, whole mountain masses being formed of the large genus Nummulites. Brachiopoda are rare, but Conchifera, Gasteropoda, and Cephalopoda increase in number; the new forms being generically almost identical with those now living. The principal living orders of fish, reptiles, and birds are represented in the Eocene strata. A considerable variety of pachydermatous mammals, apparently suited to live on marshy grounds and the borders of lakes, has been found in France and England; and associated with them are some carnivorous animals, whose remains are, however, much rarer. An opossum has been found at Colchester, England. The fragments belonging to a supposed monkey are portions of a small pachyderm, *Hyracotherium* (see under HYRAX).

Little need be said of the invertebrata of the Miocene period, beyond remarking their growing identity in genera with the living forms. Among the mammals, the Quadrumana make their first appearance. The true elephant and the allied mastodon are represented by several species; a huge carnivorous whale has been discovered, and several Carnivora and deer, with a huge edentate animal, have been described. Owen thus speaks of these animals: 'Our knowledge of the progression of mammalian life, during the Miocene period, teaches us that one or two of the generic forms most frequent in the older Tertiary strata still lingered on the earth, but that the rest of the Eocene Mammalia had been superseded by new forms, some of which present characters intermediate between those of Eocene and those of Pliocene genera.'

In passing upward through the Tertiary strata, the organic remains become more and more identical with living forms; so that when we reach the Pliocene and Pleistocene periods, the great proportion of the invertebrata are the same species which are found occupying the present seas. Among the higher orders of animals, the life of a species is much shorter than in the lower; consequently, though the vertebrata approach so nearly to existing forms as for the most part to be placed in the same genera, yet the species differ from any of the living representatives of the different genera.

The Suffolk 'Crags,' the only British representatives of the Pliocene period, contain the relics of a marine testacea, that differs little from the present tenants of the European seas, between 60 and 70 per cent. being the same species. The ear-bones of one or more species of Cetacea have been found; and at Antwerp the remains of a dolphin have been discovered in beds of this age.

The various local deposits which together form the Pleistocene strata, latest of the geological periods, contain a great variety of organic remains. In the submarine forests and in beds of peat, the stumps of trees are associated with the remains of underwood and herbaceous plants of species still living. Nearly all the Mollusca and other marine invertebrata still survive. It is among the vertebrata that the most remarkable forms appear—forms which in the main differ little from the existing race of animals, except in their enormous size. Elephants and rhinoceroses, fitted for a cold climate by their covering of long coarse hair and wool, roamed over the northern regions of both the old and the new world, and were associated with animals belonging to genera which still exist in the same region, as bears, deer, wolves, foxes, badgers, otters, wolverines, weasels, and beavers, besides others whose representatives are now found further south, as the hippopotamus, tapir, and hyena. Contemporary with these, there lived in S. America a group of animals which were types in everything but in size of the peculiar existing fauna of that continent: among these were gigantic sloth-like animals, fitted to root up and push down the trees, instead of climbing to strip them of their foliage, like the sloth. The armadillo was represented by the huge Glyptodon, whose body was protected by a strong tessellated coat of mail. The species of fossil tapirs and peccaries are more numerous than their living representatives. The lamas were preceded by the large Macrauchenia, and the opossums and platyrhine monkeys also were prefigured by related species. Besides these, there have been found the remains of two mastodons and a horse, none of which are represented by any indigenous living animal in S. America. The peculiar group of animals confined to Australia were prefigured by huge marsupials, some having close analogies to the living kangaroos and wombats, while others were related to the carnivorous native tiger. The gigantic wingless birds of New Zealand correspond in type with the anomalous apteryx, now existing only on these islands.

Associated with the remains of elephants, mastodons, cave-bears, and cave-hyenas, there have been found, in England and France, numerous specimens of flint implements, undoubtedly the result of human workmanship, and showing at least that man was contemporaneous with these extinct animals. If more certain evidence were needed of this, it has been obtained in the discovery of flint implements, bone implements fashioned and carved by means of the flint knives, the horns of a reindeer, two kinds of extinct deer, Bos primigenius, and other animals, associated with numerous bones of man, included in the breccia of the cave of Bruniquel in France. Owen considers the evidence of the contemporaneity of the various remains as conclusive. The several human skulls which have been obtained show, according to the same authority, no characters whatever indicative of an inferior or transitional type. There are no certain data to give probability to the guesses which have been made as to the number of years which have elapsed since these deposits in which the relics of man occur were formed. The whole inquiry, moreover, is so recent, and the accumulation of facts is in such constant progress, that it would be premature to speak dogmatically on the subject.—See MAN (and the references).

PALEOPHYTOLOGY, n. *pă'lē-ŏf'ĭ-tŏl'ŏ-jĭ* [Gr. *palaios*, ancient; *phuton*, a plant; *logos*, discourse]: the science that treats of fossil plants or vegetable remains—a branch of paleontology.

PALEOPYGE, *pā-lē-ō-pī'jē* or *păl-ē-* [Gr. ancient rump]: genus of fossil Crustacea, founded on a single impression from the surface of a bed in the Longmynd, of Cambrian age. Salter believes it to be the cephalic shield of a trilobite, but it may be only an accidental marking. If it be the impression of an organism, it is so distorted and imperfect that little can be made of it; its peculiar interest arises from its being associated with the earliest forms of life observed on the globe.

PALEOSAURUS, *pā-lē-ō-saw'rŭs*, [Gr. *palaios*, ancient; *sauros*, lizard]: genus of fossil reptiles peculiar to the Permian period. The remains of two species occur in the dolomitic conglomerate at Redland, near Bristol, England. The teeth were more or less compressed, and were furnished with serrated cutting margins. The vertebræ were biconcave, and had a remarkable depression in the centre of each vertebra, into which the spinal canal was sunk. The leg-bones show that the Paleosaurs were fitted for moving on the land. Owen thus exhibits their affinities: 'In their thecodont type of dentition, biconcave vertebræ, double-jointed ribs, and proportionate size of the bones of the extremities, they are allied to the Teleosaurus; but with these they combine a Dinosaurian femur, a lacertian form of tooth, and a crocodilian structure of pectoral and probably pelvic arch.'

PALEOTECHNIC, *pā'lē-ō-tĕk'nĭk* [Gr. *palaios*, ancient; *technē*, art]: pertaining to, or in the manner of, primitive art.

PALEOTHERIUM, *pā'lē-ō-thē'rĭ-ŭm* [Gr. *palaios*, ancient; *therion*, beast]: type-genus of a family of perissodactyle ungulates, from the European Tertiary; it was founded on remains discovered by Cuvier in the gypsum beds of Montmartre, at Paris. Cuvier's restoration of the *Palæo'theridæ* made them tapiroid, or resembling the modern tapir; but later discoveries, both in the old world and in the new, of additional species and allied genera, go to show that Cuvier's *A. magnum* resembled in form rather the llama, having the neck and legs elongated, though by its fundamental characters it is related to the horses and rhinoceroses. The skull resembled somewhat that of the rhinoceros, and the snout undoubtedly was blunt, quite without a proboscis. Between *Palæotheridæ* and *Equidæ* (Horses) there is an unbroken series of gradation of forms. *Paleotherium* and the allied genera, *Monacrum*, *Paloplotherium*, and *Propaleotherium*, ranged in size from the dimensions of a sheep to those of a horse.

PALEOTROPICAL, *pā'lē-ō-trŏp'ĭk-al* [Gr. *palaios*, ancient; and Eng. *tropical*]: of or pertaining to tropical or sub-tropical parts of the old or Eastern continent. India is assigned to the middle P. region, Australia to the eastern, Ethiopia to the western.

PALEOTYPE, n. *pā'lē-ō-tīp* [Gr. *palaios*, ancient; *tupos*, a type]: the systematic notation of all spoken sounds by means of the ordinary printing-types. This phonetic system, invented by Alexander J. Ellis, avoids introducing any new types, and instead avails itself of all the forms in present use (Roman, italic, small capital, etc.): these it turns or variously disposes so that one letter may do duty for more than one sound.

PALEOUS, *pā'lē-ŭs* [It. *paglioso*, from L. *palea*, chaff]: chaff.

PALEOVOLCANIC, *pā'lē-ō-vŏl-kăn'ĭk* [Gr. *palaios*, ancient; and Eng. *volcanic*]: volcanic, of a period earlier than the tertiary: P. rocks are frequently designated as *eruptive* rocks.

PALEOZOIC, a. *pā'lē-ō-zō'ĭk* [Gr. *palaios*, ancient; *zōē*, life]: name given to the lowest division of the fossiliferous rocks, because they contain the earliest forms of life. They were formerly, and are still generally, known as the Primary rocks. The strata included under these titles are the Laurentian, Cambrian, Silurian, Old Red Sandstone, Carboniferous, and Permian systems. Phillips, for the sake of uniformity, introduced Mesozoic as equivalent to Secondary, and Neozoic to Tertiary, rocks.

PALEOZOOLOGY, n. *pā'lē-ō-zō-ŏl'ŏ-jĭ* [Gr. *palaios*, ancient; *zōŏn*, an animal; *logos*, discourse]: that branch of paleontology which treats of fossil animal remains.

PALERMO, *pa-lėr'mō*, It. *pâ-lĕr'mō:* archiepiscopal city, important seaport, and cap. of the island of Sicily; cap. also of the province of P., and with Naples, Rome, Milan, and Turin, one of the five most populous cities in the kingdom of Italy. Pop. with suburbs (1871) 186,406; (1881) 205,712. It is on the n. coast of the island of Sicily, 135 m. by water w. of Messina; lat. 38° 6′ n., long. 13° 20′ e.; in a highly cultivated and fertile plain called *La Conca d'Oro* (The Golden Shell), commanding a beautiful view of the Gulf of P., on which it stands, and backed toward the interior by ridges of mountains. In shape the town is an oblong parallelogram, the direction of its length being from s.w. to n.e. It is divided into four quadrangular parts by two great streets, the beautiful Via Vittorio Emanuele, formerly the *Via Toledo* or *Cassaro*, and the *Strada Nuova* or *Macqueda*, which cross each other at right angles in the middle of the city. It is more than four m. in circumference, is surrounded by walls pierced with 12 gates and flanked with bastions, and is defended by several batteries. The houses are balconied, flat roofed, and have glass doors instead of windows. The streets, besides the two main thoroughfares above mentioned, are generally well laid out, and there are several fine promenades, of which the most magnificent is the famous Marina, along the shore, on the line of the ancient fortifications and bordered by the palaces of the nobles. P. contains 60 parish churches; 8 abbeys; 71 monasteries and convents, to which belong 20,000 to 30,000 monks and nuns: also there are 19 oratories. Among the churches is the cathedral—the church of St. Rosalie. At intersection of the two principal streets is a large octagonal space or *Piazza*, lined with palaces, and adorned with statues and marble fountains. The royal palace is a huge pile with a splendid chapel, built 1129, and contains many pillars of rare workmanship and rich mosaics with Arabic inscriptions. The cathedral, a fine edifice, originally Gothic, but with incongruous Greek additions, is adorned with marble columns and statues, and contains monuments of Emperor Frederick II. and of King Roger, founder of the Norman monarchy in Sicily. Among principal public institutions of P. are the univ., an acad. of arts and sciences, a medical acad., an institution for arts and antiquities, a beautiful and extensive public garden, public libraries, theatres, etc. P. is an archbishop's see, residence of the gov. of the island, and seat of the supreme courts. There are manufactures of silks, cottons, oil-cloth, leather, gloves, etc. The harbor is formed by a mole, 1,300 ft. in length, on which there are a light-house and battery. Vessels, with total tonnage 700,000, enter and clear the port annually; imports amount in value to nearly $5,000,000; exports to about the same.

The environs are interesting as well as picturesque, and embrace many pleasant villas and noble mansions. N. W. of the city is Monte Pellegrino, the Eirete of the ancients, an abrupt rocky mass, in which there is a grotto or cave, in which Santa Rosalia, a young Norman princess, lived a life of religious retirement. In P., Santa Rosalia is esteemed more highly than even Santa Maria; the festival in her honor, July 9 13, is the most important on the island. During its celebration, the city is illuminated, the streets are gay and brilliant, and there is immense influx of strangers from the vicinity. But the chief feature of the festival is the procession to the cave. An immense silver image of the saint is borne thither on a wagon, 70 ft. long, 30 ft. broad, and 80 ft. high. Its form resembles that of a Roman galley, with seats for a choir. The wagon is drawn by 56 mules, covered with the gayest trappings, and driven by 28 postilions.

P., anc. *Panormus*, was probably a Phœnician colony, but had become a dependency of Carthage before the name occurs in history. With the exception of a short time about B.C. 276, when it fell into the hands of the Greeks, it was the headquarters of the Carthaginian power in Sicily, until taken by the Romans during the First Punic War, B.C. 254, when it became one of the principal naval stations of the Romans. The name Panormus is from the excellent anchorage (Gr. *hormos*) in the bay; but the Phœnician name found on coins is *Machanath*, meaning 'a camp.' The Vandals, and afterward the Arabs, made it the cap. of the island; and after the Norman Conquest it was the seat of the king of Sicily. It remained the royal residence under the Aragonese kings; but the court was removed after Sicily became united to the then kingdom of Naples: see SICILY.

PALES, *pā'lēz:* deity of the ancient Romans, somewhat resembling the Greek god Pan, and supposed to preside over flocks and shepherds. It is represented by some writers as male and by others as female. An annual festival called Palilia was held in its honor at Rome Apr. 21, this being the accepted date of the founding of the city. At this festival the participants rushed through burning straw, the stables were purified by fire and smoke, offerings of various products were made, forgiveness for neglect of service in the past was sought, petitions were offered for the safety and increase of the flocks, and the ceremonies were concluded with a feast.

PALESTINE, *păl'ĕs-tīn* (*Palæstina Philistia*), or **THE HOLY LAND:** country of s.w. Asia, comprising the s. portion of Syria, and bounded w. by the Mediterranean, e. by the valley of the Jordan, n. by the mountain ranges of the Lebanon and the glen of the Litâny (Leontes), and s. by the Desert of Sinai; lat. 31° 15′–33° 20′ n., long. 34° 30′–35° 30′ e.; present pop. prob. not exceeding 700,000. Within these narrow limits, not more than 145 m. in length by 45 in average breadth—an area less than that of the state of Vt.—is comprised the 'Land of Israel' or 'Canaan,' arena of the greatest events in the history of man. The principal physical features of P. are: (1) a central plateau or table-land, with a mean height of 1,600 ft., covered with an agglomeration of hills, which extend from the foot of the Lebanon to the s. extremity of the country; (2) the Jordan valley and its lakes; (3) the maritime plain, and the plains of Esdraëlon and Jericho. On the e., the descent from the central plateau is steep and rugged, from Lake Huleh to the Dead Sea. On the w., it is more gentle, but still well marked, toward the plains of Philistia and Sharon. The ascertained altitudes on this plateau, proceeding from s. to n., are Hebron, 3,029 ft.; Jerusalem, 2,610; Mount of Olives, 2,724; Mount Gerizim, 2,849; Mount Tabor, 1,843; Safed, 2,775 ft. above sea-level. Nearly on the parallel of the Sea of Galilee, the range of Carmel extends from the central plateau n.w. to the Mediterranean, where it terminates abruptly in a promontory surmounted by a convent. It rises from 600 ft. in the w. to 1,810 ft. in the e., and is composed of a soft white limestone, with many caverns. Beyond the boundary of P. on the n., but visible from the greater part of the country, Mt. Hermon rises to 9,381 ft., and is always snow-clad. From the formation of the central plateau, the drainage is nearly always e. and w., to the Jordan and the Mediterranean. The streams of the plateau are insignificant, and generally dry in summer.

The geological formation of the country consists of Jurassic and cretaceous limestone, in many places covered with chalk, and rich in flints, with occasional interruptions of tertiary, basaltic, and trappean deposits. The upper strata consist of limestone of white or pale brown color, containing few fossils, but abounding in caverns, which form one of the peculiarities of the country. The general features of the landscape exhibit soft rounded hills, separated by narrow glens or valleys of denudation; the strata are occasionally level, but more frequently violently contorted, as on the route from Jerusalem to Jericho, where many fissures are 1,000 ft. deep, and only 30 or 40 ft. wide. Ironstone occurs in small quantities; rock-salt, asphaltum, and sulphur abound near the Dead Sea, where, as also near the Sea of Galilee, are many hot springs. Volcanic agency is evident in the obtruded lava of former ages, and in frequent earthquakes of modern times. The vast crevasse through which the Jordan flows, and which cleaves the land from n. to s., is one of the most remarkable fissures on the globe; it is 5 to 12 m. wide, and of the extraordinary depth of 2,630 ft. at the bottom of the Dead Sea. Through this the river Jordan descends at the rate of 11 ft. in a mile, with a course so tortuous that it travels 132 m. in a direct distance of 64, between the Sea of Galilee and the Dead Sea. It is the only perennial river of P., except the Kishon, which is permanent only in its lower course, and the Litány, on its n. border: see JORDAN. The only lakes of P. are in the valley of the Jordan. See GENNESARET, SEA OF: DEAD SEA.

The plain of Philistia extends from the coast to the first rising ground of Judah, about 15 m. in average width; the soil is a rich brown loam, almost without a stone. It is in many parts perfectly level; in others undulating, with mounds or hillocks. The towns of Gaza and Ashdod, near the sea, are surrounded by groves of olives, sycamores, and palms. This plain is still, as it always was, a vast grain-field, an ocean of wheat, without a break or fence; its marvellous fertility has produced the same succession of crops, year after year, for 40 centuries, without artificial aid. The plain of Sharon is about 10 m. wide in the s., narrowing toward the n., till it is terminated by the buttress of Carmel. Its undulating surface is crossed by several streams; the soil is rich, and capable of producing enormous crops; but only a small portion of it, near Jaffa, is cultivated, and it is rapidly being encroached on by the sea sand, which, between Jaffa and Cæsarea, extends to a width of 3 m. and a height of 300 ft. The famous ancient cities of this region, Cæsarea, Diospolis, and Antipatris, have vanished. Jaffa (Joppa) alone remains, supported by travellers and pilgrims from the west, on the way to Jerusalem. The great plain of Esdraëlon, or Jezreel, extends across the centre of the country from the Mediterranean to the Jordan, separating the mountain ranges of Carmel and Samaria from those of Galilee. Its surface is drained by the Kishon, which flows w. to the Mediterranean at Haifa. The plain is surrounded by the hills of Gilboa and Little Hermon; the isolated Mount Tabor rises on its n.e. side. It is extremely fertile in grain where cultivated, and covered with gigantic thistles where neglected. It is richest in the central part, which slopes e. to the Jordan—the battle-field where Gideon triumphed, and Saul and Jonathan were overthrown. It is the home of wandering Bedouins, who camp in its fields, and gallop over its greensward in search of plunder. Many places of deep historical interest are connected with this plain. Shunem, Nain, Endor, Jezreel, Gilboa, Bethshan, Nazareth, and Tabor are in its vicinity. The plain of Jericho is a vast level expanse, covered with the richest soil, now quite neglected. Around the site of Jericho, 'the city of palm-trees,' there is not now a single palm; but a recent experiment proved its capability of producing in abundance all the crops for which it was formerly famous. The climate of P. is very varied; Jan. is the coldest and July the hottest month. The mean annual temperature of the year at Jerusalem is 65° Fahr., resembling that of Madeira, the Bermudas, and California. The extreme heat of the summer months is modified by sea breezes from the n.w. In the plain of Jericho and the Jordan valley it is extremely hot and debilitating. The *sirocco*, a s.e. wind, is often oppressive in early summer. Snow falls in the uplands in Jan. and Feb., and thin ice at that period is frequent at Jerusalem, where the annual rainfall is 61 inches. Heavy dews fall in summer, and the nights are cold. Violent thunder-storms occur in winter. In the s., Judah and part of Benjamin, is a dry, parched land; the bare limestone rock is covered here and there with a scanty soil, and the vast remains of terraces show how assiduously it must have been cultivated in ancient times to support the teeming population indicated by the ruins of cities with which every eminence is crowned. To the n. of Judea the country is more open, the plains are wider, the soil richer, and the produce more varied, till at Nabulus the running streams and exuberant vegetation recall to the traveller the scenery of the Tyrol. Even in its desolation, P. is a land flowing with milk and honey. There is no evidence of its climate having changed or deteriorated, nor any reason to suppose that it would fail to support as great a population as ever it did, provided the same means as formerly were used for its cultivation. It has the same bright sun and unclouded sky, as well as the early and latter rain, which, however, is diminished in quantity, owing to the destruction of forests.

The botany of P. is rich and varied, resembling that of Asia Minor. Among its trees are the pine, oak, elder, and hawthorn in the n. and higher districts, and the olive, fig, carob, and sycamore elsewhere. The cultivated fruits are the vine, apple, pear, apricot, quince, plum, orange, lime, banana, almond, and prickly pear. Wheat, barley, peas, potatoes, and European vegetables, cotton, millet, rice, maize, and sugar-cane are among its products. The date now ripens its fruit only in the south and on the seaboard. The brilliant flowers which in spring enamel the surface, and tinge the entire landscape, comprise the adonis, ranunculus, mallow, poppy, pink, anemone, and geranium. In the Jordan valley, 900 or 1,000 ft. *below* the sea-level, the vegetation is tropical, resembling that of Arabia; the nubk (*Spina Christi*), the oleander, and the small yellow 'apples of Sodom' are conspicuous. The most valuable products of the vegetable kingdom are from the vine, fig, olive, and mulberry trees. Wine for home use is made in all the central and s. districts; the best is made at Hebron from the grapes of Eshcol. Olive-oil is a valuable export.

The wild animals of P. comprise the Syrian bear in Lebanon, the panther, jackal, fox, hyena, wolf, wild boar, gazelle, and fallow-deer: the lion is now unknown. The domestic animals are the Arabian camel, ass, mule, horse, buffalo, ox, and broad-tailed sheep. Among birds are the eagle vulture, kite, owl, nightingale, jay, and kingfisher—the latter of brilliant plumage—the cuckoo, heron, stork, crow, partridge, and sparrow. Fish swarm in the Sea of Galilee, and bats and lizards abound.

The divisions of P. in Old Testament times were into 9½ tribes in the w., and 2½ tribes in the e., of the Jordan: in New Testament times, w. of the Jordan, the provinces of Galilee in the n., Samaria in the middle, and Judea in the s.; e. of the Jordan, Perea and Decapolis. The boundaries of the tribes and provinces are very uncertain. Under Turkish rule, P. is comprised in the vilayet of Syria. The present population consists mainly of a race of mixed descent, sprung from Syrians, Arabs, and Greeks; they speak Arabic, and are mostly Moslems, some of them nomadic. There are a number of Greek Christians of Syrian descent; a few official Turks, some Maronites, Rom. Catholics, and Armenians. The Jews, a few thousands in number, are mostly from Spain and Germany, and are mainly in Jerusalem, Hebron, Tiberias, and Safed. A colony of 750 Germans established themselves some years ago about Carmel and Jaffa. The country is oppressed by Turkish avarice, and overrun by the predatory Arabs. The Palestine exploration societies, English and American, organized 1865, have done good work in the identification of biblical and classical sites. See SYRIA: JEWS: HITTITES.

PALESTRA, n. *pă-lĕs′tră* [Gr. *palaistra*, a place for wrestling—from *palai′ō*, I wrestle]: the place of wrestling; exercises of wrestling; gymnastics. PALESTRIAN, a. *pă-lĕs′trĭ-ăn*, or PALESTRIC, a. *pă-lĕs′trĭk*, pertaining to the art of wrestling.

PALESTRINA, *pâ-lĕs-trē′nâ:* Italian city, 22 m. e.s.e. of Rome, on the slope of an offset of the Apennines. Pop. 6,000. Besides several interesting churches, the town contains a castle, once the chief stronghold of the Colonna, to whom the town belonged; and the palace and garden of the Barberini family. The view across the Campagna and toward the Alban Hills is magnificent. There is manufacture of coarse woolen goods.

P. is built almost entirely upon the site and the gigantic substructions of the Temple of Fortune, one of the great edifices of the former city of Præneste. This city was one of the most ancient as well as powerful cities of Latium. It covered the hill (2,400 ft. above sea-level) on the slope of which the modern town stands, and was overlooked by a citadel of great strength. The site of this citadel on the summit of the hill is now occupied by a castle of the middle ages, *Castel S. Pietro;* but remains of the ancient walls are still visible. We hear of Præneste first as a member of the Latin League; but B.C. 499 it quitted the confederacy, and joined the cause of the Romans. B.C. 380 the Prænestines, having rejoined their ancient allies, opened a war with Rome; but were completely routed on the banks of the Allia by T. Quintius Cincinnatus, and beaten back to their own gates. They were prominent in the famous Latin War, B.C. 340. Having given shelter to the younger Marius, B.C. 82, this city was besieged by the forces of Sulla, was taken, and all the inhabitants were put to the sword. A military colony was then established in their place, and soon the city began to flourish anew. Its elevated and healthful situation, at no great distance from the capital, made it a favorite summer resort of the Romans. Augustus frequented it; Horace often found this city a pleasant retreat; and here Hadrian built an extensive villa. The Temple of Fortune is described by Cicero as an edifice of great antiquity and splendor, and its oracle was much consulted. The town became the stronghold of the family of Colonna in the middle ages; but was given to the Barberini family by Urban VIII.

PALESTRI'NA, GIOVANNI PIERLUIGI DA: distinguished musical composer: prob. 1524–1594, Feb. 2; b. at Palestrina (q.v.), whence his surname. At the age of 16, he went to Rome, and studied music under Claude Goudimel, afterward one of the victims of the St. Bartholomew massacre. In 1551 he was made *maestro di capella* of the Julian Chapel, and 1554 he published a collection of Masses, so highly approved by Pope Julius III., to whom they were dedicated, that he appointed their author one of the singers of the pontifical chapel. Being a married man, he lost that office on the accession to the pontificate of Paul IV., in whose eyes celibacy was a necessary qualification for its duties. In 1555 he was made choir-master of St. Maria Maggiore, and held that position till 1571, when he was restored to his office at St. Peter's. In 1563, the Council of Trent having undertaken to reform the music of the church, and condemned the secular words and music introduced into Masses, some compositions of P. were pointed to as models, and their author was intrusted with the task of remodelling this part of religious worship. He composed three Masses on the reformed plan; one of them, known as the Mass of Pope Marcellus (to whose memory it is dedicated), may be considered to have saved music to the church by establishing a type far beyond anything that had preceded it, and, amid all the changes which music has since gone through, stands as the model of Roman ecclesiastical music. It was sung in the Sistine Chapel, first, 1565, June 19; and was produced in England for the first time 1882, when its music was pronounced 'the most beautiful, the most solemn, and the most truly devotional that has ever been dedicated to the service of the church.' During the remaining years of his life, the number and the quality of the works of P. are equally remarkable. His published works consist of 13 books of Masses, 6 books of Motets, 1 book of Lamentations, 1 of Hymns, 1 of Offertories, 1 of Magnificats, 1 of Litanies, 1 of Spiritual Madrigals, and 3 books of Madrigals. P. is considered the first musician who reconciled musical science with musical art, and his works form a most important epoch in the history of music. Equally estimable in private life, and gifted as a musician, P. struggled through a life of poverty during eight pontificates; his appointments were meagre, and his publications unremunerative. A memoir of his life and writings has been written by Abbé Baïni.

PALESTRO, *pâ-lĕs′tro:* village of Piedmont, 8 m. s.e. of Vercelli, famous as the scene of a battle between the Sardinians and Austrians 1859, May. The Piedmontese drove the Austrians from this village May 30, and on the 31st defended it with great bravery against an Austrian attack. The Piedmontese in this battle were assisted by 3,000 French Zouaves, and the Austrians lost 2,100 men killed and wounded, 950 prisoners, and 6 pieces of cannon. June 1 the allies entered Novara.

PALETIOLOGY, n. *pā-lĕ′shĭ-ŏl′ō-jĭ* [Gr. *palaios*, ancient; *aitĭă*, cause; *logos*, discourse, reason]: the science which explains, by the law of causation, the past condition and the changes of the earth. PALE′TIOLOG′ICAL, a. *-ō-lŏj′ĭ-kăl*, connected with or relating to paletiology. PALE′TIOL′OGIST, n. *-ŏl′ō-jĭst*, one versed in.

PALETOT, n. *păl′ĕ-tō* [F. *paletot;* OF. *palletoc*, a short coat with sleeves: Bret. *paltok*, a coarse cloak worn by peasants at their work—from *pall*, a covering, and *tok*, a cap: comp. Gael. *peall*, a skin or hide; *pealltag*, a sheepskin jacket]: a light loose overcoat. *Note.*—Skeat derives this word from O. Dut. *pals*, later written *palts*, answering to Ger. *pfalz:* comp. *palsgrave*, a count palatine. Hence *pals* = Eng. *palace*, and the sense is palace-coat, i.e., court-dress. The word, however, may be connected with L. *palla*, *pallium*.

PALETTE, n. *păl′ĕt* [F. *palette*, a palette, a surgeon's slice—from *pale*, the blade of an oar; *pelle*, a shovel: It. *paletta*, a little shovel—from *pala*, any kind of flat and broad thing, a spade—from L. *pāla*, a spade]: the small oval flat of wood or other material on which a painter lays his colors while painting, having a thumb-hole at one end for holding it; spelled also PALET (see PAINTING). To SET THE PALETTE, to lay upon it the pigments in a certain order, selecting them according to the key in which the picture is to be painted. PALETTE-KNIFE, a thin, flat knife rounded at the end, used to mix colors on the grinding-slab, and to assist their incorporation by the muller.

PALEY, *pā'li*, **WILLIAM**, D.D.: English divine: 1743–1805, May 25; b. Peterborough. His father was a Yorkshireman, and not long after P. was born returned to his native parish of Giggleswick, one of the wildest and most sequestered districts in the West Riding, to become master of the grammar school there. Young P. was brought up among the shrewd, hard-headed peasantry of Yorkshire; and it is probable that he either naturally possessed or insensibly acquired their moral and mental characteristics. At all events, he soon became conspicuous in the family for his good sense; and when he left to enter Christ's College, Cambridge, as a sizar, in his 16th year, his father said: 'He has by far the clearest head I ever met with.' At Cambridge, P. led for the first two years a gay, idle, and dissipated life, but thereafter became a severe student, and took his bachelor degree 1763 with highest honors. He then taught for three years in an acad. at Greenwich. In 1765 he obtained the first prize for a prose Latin dissertation—the subject being 'A Comparison between the Stoic and Epicurean Philosophy, with respect to the Influence of each on the Morals of a People,' in which he characteristically argued in favor of the latter. Next year he was elected a fellow and tutor of Christ's, and took the degree M.A. In 1767 he was ordained a priest. His career of 10 years as a college tutor was eminently successful; and during this period he appears to have systematized his principles in moral and political philosophy. In 1776 P. married, and was of course obliged to give up his fellowship, but was compensated by a presentation to the livings of Mosgrove and Appleby in Westmoreland and of Dalston in Cumberland. Four years later he was collated to a prebendal stall in the cathedral church of Carlisle, 1782 he became archdeacon, and 1785 chancellor of the diocese. In 1785 he published his *Elements of Moral and Political Philosophy.* In this work he propounds his ethical theory, commonly called utilitarianism, but really a theological adaptation of the utilitarian philosophy. He begins by renouncing the favorite doctrine of the Moral Sense, against which he adduces a series of strong objections. He then takes up the question of the source of obligation, and resolves it into the will of God, enforced by future reward and punishment, admitting candidly that virtue is prudence directed to the next world. The will of God, so far as it is not rendered explicit by revelation, is to be interpreted by the tendency of actions to promote human happiness; the benevolence of the Deity being supposed. Objection has frequently been taken to the principles on which P. rests his system, but the lucidity and appositeness of his illustrations are conceded. His treatise is now commonly judged to have failed in sounding the depth of 'moral obligation,' but it at least brushed off into oblivion the shallow and muddy mysticism that had long enveloped the philosophy of politics. P.'s plain sarcastic view of the 'divine right of kings,' which he puts on a level with the 'divine right of constables,' gave extreme offense to George III., but is now held by everybody to be beyond question. In 1790 appeared his most original and valuable work—*Horæ Paulinæ, or the Truth of the Scripture History of St. Paul evinced by a Comparison of the Epistles which bear his Name with the Acts of the Apostles, and with one another.* The aim of this admirable work is to prove, by a great variety of 'undesigned coincidences,' the improbability, if not impossibility, of the usual infidel hypothesis of his time—viz., that the New Testament is a 'cunningly devised fable.' It was dedicated to his friend John Law, then bp. of Killala in Ireland, to whose favor he had been indebted for most of his preferments. P.'s next important work, less original than the preceding, but very dexterous and effective, was *A View of the Evidences of Christianity*, pub. 1794. Later and keener criticism is not satisfied with P.'s 'Evidences;' but in P.'s own day he was held to have achieved a splendid triumph over skeptics. The bp. of London appointed him a prebend of St. Pancras; shortly afterward he was promoted to the sub-deanery of Lincoln (£700 per annum); Cambridge conferred on him the degree D.D.; and the bp. of Durham the rich rectory of Bishop Wearmouth (£1,200 per annum), in consequence of which he honorably resigned his livings in the diocese of Carlisle. After 1800 he became subject to a painful disease of the kidneys; yet he continued to write, and in 1802 published perhaps the most widely popular of all his works—*Natural Theology, or Evidences of the Existence and Attributes of the Deity;* which, however, is based, and to a large extent borrowed, from the *Religious Philosopher*, the work of a Dutch philosopher named Nieuwentyt, an English translation of which appeared 1718–9. The plagiarisms are palpable, but have been accounted for on the supposition that the *Natural Theology* was 'made up' from his loose papers and notes written when P. was a college tutor, and that he had forgotton the sources from which he derived them. He has, however, taken nothing which he has not greatly improved. A noted ed. of this work, expanded by annotations and dissertations, is that by Lord Brougham and Sir Charles Bell (1836–39). P. had a family of four sons and three daughters. A complete ed. of his works was pub. 1838 by one of his sons, the Rev. Edmund P. The best biography is by Meadley (1809).

PALFREY, n. *pawl'frĭ* [prov. F. *palefrei;* F. *palefroi*—from It. *palefreno*—from mid. L. *parafrēdus*, an easy-going horse for riding: mid. L. *veredus*, a post-horse: perhaps connected with Ger. *pferd*, a horse]: an ordinary riding-horse, as distinguished from a war-horse; a small or gentle horse fit for a lady's use. **PALFREYED**, a. *pawl'frid*, riding on or supplied with a palfrey.

PALFREY, *pawl′frē* or *-frĭ*, JOHN GORHAM, D.D., LL.D.: historian: 1796, May 2—1881, Apr. 26; b. Boston. He studied at Phillips Academy, Exeter; graduated from Harvard 1815; and became pastor of the Brattle Square (Unitarian) Church in Boston 1818, succeeding Edward Everett. He resigned 1830, and the following year became prof. of sacred literature in Harvard College. He was a member of the state legislature 1842; sec. of state 1844–47; member of congress 1847–49, being elected as a whig; was unsuccessful as a candidate of the free-soil party for re-election; and was defeated for gov. 1851.—He was one of the founders of the republican party, was postmaster of Boston 1861–67, and in the latter year was a member of the Anti-Slavery Congress at Paris. During his public life he had been a close student and had become widely known as an able writer. He edited the *North American Review* 1835–43; furnished for the *Boston Whig* a series of able articles on *The Progress of the Slave Power;* and was, for a time, on the editorial staff of the *Commonwealth.* He was also a lecturer at the Lowell Institute, Boston, 1839 and 42. Besides numerous smaller works, he published: *Academical Lectures on the Jewish Scriptures and Antiquities*, 4 vols. (1833–52); *The Relation between Judaism and Christianity* (1854); and a *History of New England*, 3 vols. (1858–64). An abridgment of the latter work appeared in 2 vols. (1866), and 2 additional vols. were issued (1872–3). At the time of his death, which occurred at Cambridge, he was bringing the work down to a later date than it had previously reached.

PALGRAVE, *pawl′grāv*, Sir FRANCIS: antiquary and historian: 1788, July—1861, July 6; b. London; of Jewish parentage, son of Meyer Cohen, member of the stock exchange. He was educated at home under a Dr. Montucci, and early showed extraordinary genius. When only eight years old, he made a translation into French of the *Battle of the Frogs and Mice*, from the Latin version of Beauclerc, which was printed by his father 1797. In 1803 he was articled as a clerk to a legal firm, and continued with the same firm as managing clerk until 1822, when he took employment under the Record Commission. He had previously made himself known as a literary antiquarian, by the publication 1818 of some Anglo-Norman chansons, which he edited with much care. On the occasion of his marriage, 1823, he changed his name to P., the maiden name of his wife's mother. He was called to the bar 1827, and had considerable practice for some years in pedigree cases before the house of lords. In 1831 he published a *History of England*, a part of the *Family Library;* 1832 appeared his *Rise and Progress of the English Commonwealth;* also *Observations on the Principles, etc., of New Municipal Corporations.* In that year he received the honor of knighthood, and was subsequently one of the municipal corporation commissioners. He was one of four dissentients from the commissioners' report, 1835, and published his protest against it. On the reconstruction of the record service, 1838, Sir F. P. was appointed deputy-keeper of her majesty's records, and held that office during the rest of his life. He edited for the govt.: *Calendars of the Treasury of the Exchequer*, *Parliamentary Writs*, *Curia Regis Records*, and *Documents Illustrative of the History of Scotland.* In his private capacity, he produced *The Merchant and the Friar*, an imaginary history of Marco Polo and Friar Bacon; also *Handbook for Travellers in N. Italy*, and *History of England and Normandy* (4 vols. 1851–64). Sir F. P. wrote also numerous articles for the *Edinburgh* and *Quarterly Reviews.* His great merit as a historic writer was in manifesting the advantage of careful study of the original sources of information among British public records. He died at Hampstead.—His son, **Francis Turner P.** (b. 1824), has been engaged in educational work under the govt., and has published essays on art and poems.

PAL'GRAVE, William Gifford: Rom. Cath. missionary and explorer: b. Westminster, England, 1826, Jan. 24; son of Sir Francis P. He graduated with honors from Trinity College, Oxford, 1846; was an army officer at Bombay 1847–53, and while in India joined the Rom. Cath. Church. He afterward graduated from the Jesuit theol. seminary at Laval, France; received ordination as a priest, and for several years was in active missionary work in Syria. He was called to France 1860 by Emperor Napoleon III., to report on the disturbed condition of Syria, and the following year was commissioned by the emperor and encouraged by his religious superiors to explore the central and e. portions of Arabia. Disguised as a physician, he accomplished this dangerous feat 1862–3. He returned to Europe, retired from the order of Jesuits 1864, was sent to Egypt 1865 by the British govt., to secure the release of prisoners held in Abyssinia, and was appointed consul at Soukhoum-Kalé 1866, at Trebizond the following year, at St. Thomas 1873, Manila 1876, and consul-gen. to Bulgaria 1878. In 1880 he became consul-gen. to Siam. Among his published works are: a *Narrative of a Year's Journey through Central and Eastern Arabia*, 2 vols. (1865); *Essays on Eastern Questions* (1872); *Hermann Agha*, 2 vols. (1872); *Alkamah's Cave* (1875); and *Dutch Guiana* (1878). He is an honorary member of various foreign scientific bodies; a fellow of the Royal Geographical Soc. and of the Royal Asiatic Society.

PALI n. *pâ′lē* [corruption of Skr. *Prâkrit* (q.v.)]: sacred language of Buddhism, an Aryan tongue, extinct as a spoken language. Its origin must be sought for in one or several of the popular dialects of anc. India, comprised under the general name of Prâkrit, and related to Sanskrit as the Romance languages in their earlier period are to Latin. It was formerly assumed that P. arose from the special Prâkrit dialect Mâgadhî, or the language spoken in Magadha; but, according to the view expressed by Lassen in his *Indische Alterthumskunde*, this hypothesis is not tenable, since the peculiarities of this dialect are not compatible with those of the P. The same distinguished scholar holds that the Prâkrit dialects called the S′aurasenî and Mâhârâsht′rî have a closer relation to the P. than any other, and that the origin of the P. must therefore be traced to w. Hindustan, between the Jumna river and the Vindhya Mountains; though he observes, at the same time, that the P. is older than these dialects, which are therefore more remote than it from Sanskrit. Whether the oldest works of the Buddhist religion were written in P. is doubtful. It is more probable that the language in which the founder of the Buddhist religion conveyed his doctrine to the people was not yet that special language, but a mixture of classical and popular Sanskrit, such as it still appears in the Buddhistic Sûtras. Later, however, P. became the classical language in which the Buddhists wrote their sacred, metaphysical, and secular works. The most important historical work in this language is the *Mahâvans′a* (q.v.); other P. works which have lately become known in Europe are the *Dhammapada*, on the Buddhist doctrine, and five *Jâtakas*, containing a fairy-tale, a comical story, and three fables—edited and translated by V. Fausböll (Copen. 1855 and 61). P. ceased to be a living language of India when Buddhism was rooted out of it; it was carried by the fugitive Buddhists to other countries, especially Ceylon, Burmah, and Siam; but in these countries, too, it gave way before the native tongues, in which the later Buddhist literature was composed.

PALICHTHYOLOGY, n. *pā-lĭk′thĭ-ŏl′ŏ-jĭ* [Gr. *palaios*, ancient; *ichthus*, a fish; *logos*, discourse]: that branch of paleontology which treats of fossil fishes.

PALIFICATION, n. *păl′ĭ-fĭ-kā′shŭn* [L. *palus*, a stake or post; *făcĭō*, I make]: the act or process of rendering ground firm by driving posts or piles into it.

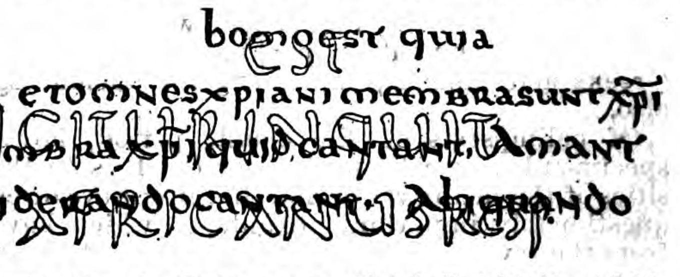
PALILOGY, n. *pă-lĭl′ŏ-jĭ* [Gr. *palin*, again; *logos*, a discourse]: in *rhet.*, the repetition of a word, or the fragment of a sentence, with the view of increased energy.

PALIMPSEST, n. *păl'ĭmp-sĕst* [Gr. *palimpsēs'tos;* L. *palimpsēs'tus*, parchment the writing of which has been effaced for other writing—from Gr. *palin*, again; *psāō*, I rub away or scrape]: a MS. parchment, or of papyrus, paper, or other material, which, after only a partial erasure, has been written over a second time, and on which the former writing is more or less discernible. When the MS. had been written with one of the species of ink employed by the ancients, merely a fatty pigment, chiefly of lamp-black, and only coloring the surface, but not producing a chemical change, there was little difficulty in obliterating the writing: it was accomplished by the use of a sponge, and, if necessary, of a scraper and polishing-tool; and, where proper pains were taken, the erasure of the first writing was complete. But when the ink was mineral, its effect reached beyond the surface. In that case a scraping-tool or pumice-stone was indispensable; if these were hastily or insufficiently applied, the erasure was imperfect; and thus it often happens in ancient MSS. that, from lack of proper care by the copyist in preparing the parchment for rewriting, the original writing may still be read without difficulty.

The practice of re-preparing used parchment for second use existed among the Romans: the material thus re-prepared was reserved for the meaner uses. We meet frequent allusions in the classical writers, as Plutarch, Cicero (*Ad Familiares*, vii. 18), Catullus (xxii. 115), and others, to the P., in the sense of a blotter or first-draft book, on which the rough outline or first copy of a document was written, preparatory to the accurate transcript for actual use; and it appears equally certain that in many cases whole books were written upon re-prepared parchment or papyrus, not only among the Greeks and Romans, but among the ancient Egyptians also.

Of palimpsests of the classic period, however, no specimen has ever been discovered. It is to the necessities of the mediæval period that literature owes the unquestionably important advantages which have arisen from the revival of the ancient practice of re-preparing already used material for writing. Under the early emperors, the intercourse with Egypt and the east secured a moderately cheap and abundant supply of Papyrus (q.v.), which rendered it unnecessary to recur to the expedient of the P.; and this became still more the case in the 5th and 6th c., when the tax on papyrus was abolished. But after the separation of east and west, and still more after the Mohammedan conquest of Egypt, the supply of papyrus almost completely ceased; and from the 7th c. in the west, and the 10th or 11th in the east, the P. is found in comparatively frequent use; and its frequency in the 15th c. may be estimated from the fact that some of the earliest books were printed on P. Some writers have ascribed the prevalence of its use to the indifference and even hostility of the monks and clergy to classical literature, and have attributed to their reckless destruction of classic MSS., in order to provide material for their own service-books and legendaries, the deficiencies in the remains of ancient learning which scholars now deplore. Some part of the loss doubtless thus arose, though it is certain that we owe to the mediæval monks and clergy whatever of ancient literature has been preserved to our day. But the condition in which the existing palimpsests are uniformly found—mostly mere fragments of the ancient writers whose works they originally contained—shows that the MSS. broken up by the mediæval copyists for their own purposes were almost always already imperfect, or otherwise damaged; nor is there anything in the condition of any single P. which has reached our day to justify the belief that, when taken for rescription, the original work was in a state at all approaching completeness. Fortunately, however, there are many of the relics of ancient learning of which even the mutilated members have an independent value; and this is true especially of biblical MSS., particularly under the critical aspect; and, in a still broader sense, of all the remains of the ancient historians.

Since the chief, if not the sole, interest of palimpsest MSS. lies in the ancient writing which they had contained, their value to literature mainly depends on the degree of legibleness which the ancient writing still retains. It is difficult to make this fully intelligible to the reader without an actual inspection, but the facsimile annexed illustrates it. The passage selected for the illustration is from page 62 of the Vatican MS., from which Mai deciphered the fragments of the *De Republica*. The darker letters are those of the modern MS.; the faint lines are those of the original codex. Although so much more faint than the modern writing, they can be read with facility on account of their greater size. We transcribe both texts in ordinary characters. The original was as follows:



EST

IGITUR INQUIT

AFRICANUS RESP.

(The ordinary contraction for *Respublica.*)

The corresponding lines of the modern MS., from St. Augustine's commentary on the Psalms, are:

homo est quia
et omnes Xρîani (Christiani) membra sunt Xρι. (Christi)
membra Xρι. quid cantant. Amant
Desiderando cantant. Aliquando

In this specimen, as very commonly occurs, the original writing is much larger than the modern; the modern lines and letters do not cover those of the old MS., but they follow the same order. In other specimens the new writing is transverse; in some, the old page is turned upside-down. Sometimes, where the old page is divided into columns, the new writing is carried over them all in a single line; sometimes the old page is doubled, so as to form two pages in the new MS.; sometimes it is cut into two or even three pages. The most perplexing case of all for the decipherer is that in which the new letters are of the same size and are written upon the same lines with the original. Examples of this are rare, and, even when they occur, the difference between the form of the ancient characters, ordinarily uncial, and that of the modern, is a great aid to the decipherer. Some variety, also, is found in the language of the palimpsests. In those in the western libraries, the new writing is almost invariably Latin, while the original is sometimes Greek and sometimes Latin. In the palimpsests discovered in the east, the original is usually Greek, the new writing being sometimes Greek, sometimes Syriac, sometimes Armenian; and one P. whose material is papyrus is found in which the original was the enchorial Egyptian language, while the modern writing is Greek.

The possibility of turning palimpsest MSS. to account in extending our store of ancient literature was suggested as far back as the days of Montfaucon; but the idea was not practically carried out till the latter part of the 18th c. The first P. editor was a German scholar, Dr. Paul Bruns, who having discovered that one of the Vatican MSS. was a P., the effaced matter of which was a fragment of the 91st book of Livy's *Roman History*, printed it at Hamburg 1773. In the field of discovery thus opened by Bruns, little progress was made until the following century, when Dr. Barrett of Trinity College, Dublin, published his P. Fragments of Matthew's Gospel, and when P. literature at once rose into interest and importance in the hands of the celebrated Angelo Mai (q.v.). A detailed account of Mai's successes is given below, with the principal publications in this curious department of letters (for the history of Mai's personal labors, see MAI, ANGELO). The great historian Niebuhr about the same time applied himself to the subject, and was followed by Blume, Pertz, Gaupp, and other German scholars, whose labors, however, were mostly confined to the department of anc. Roman law. More recently, the discoveries of Dr. Tischendorf in biblical literature, and those of Dr. Cureton in sacred and profane literature, have added importance to the palimpsest

MSS. supposed to remain in the monasteries of the Levant. Herr Mone has had similar success in the department of liturgical literature, and Dr. Frederick Augustus Pertz, son of the scholar above mentioned, may be said to have carried to its highest point the interest which attaches to these curious researches, by editing from a *thrice-written palimpsest* a considerable series of fragments of the Roman annalist Gaius Granius Licinianus.

It remains to enumerate the most important P. publications which have hitherto appeared, distributed according to the language of the effaced original:

I. Greek Palimpsests.—Among these, the first place belongs to the Greek biblical palimpsests, the earliest of which was (1) *Fragments of the Gospel of St. Matthew*, in fac-simile as well as in *ordinary* type, printed from a palimpsest MS. of Trinity College, Dublin, by the Rev. I. Barrett, D.D. (4to, Dublin 1801). The original writing appears to be of the 6th c. Dr. Barrett's transcript of the text has not proved in all respects correct, but the original has since been carefully re-examined, and the ancient writing fully brought out. It is chiefly, however, to a collection of Syriac MSS. brought from the east that we are indebted for the more recent P. restorations of the ancient biblical readings. In this line the chief discoverer has been Dr. Constantine Tischendorf. From his pen we have (2) the celebrated *Codex Ephremi* or *Codex Regius* of the Royal Library at Paris. This MS. has been early observed to be P., and the original Greek text was collated in part by Wetstein and by Küster. It was still more carefully examined by M. Hase 1835; and finally, 1840, by Dr. Tischendorf, by whom the New Test. was printed 1843, and the fragments of the Old 1845. The modern writing of this P. consisted of the works of St. Ephrem the Syrian. (3) *Fragmenta Sacra Palimpsesta* (4to, Leipzig 1855), containing fragments of the Books of Num., Deut., Josh., Judges, Kings, Is., together with 48 pages of fragments of the New Test., the Gospels, the Acts, and the Epistles of Paul to the Corinthians and to Titus. The modern writing of these palimpsests was partly Greek, partly Armenian and Arabic. (4) *Fragmenta Evangelii Lucæ et Libri Genesis* (4to, Leipzig 1857). The fragments of Luke's Gospel amount to 95 pages. The vol. contains also fragments of John's Gospel and of Ezekiel and the Third Book of Kings. The modern writing is partly Syriac, partly Coptic. With these biblical palimpsests (5) may be classed another, the original of which, however, contains not only some Greek fragments, but also portions of the ancient Gothic version of the Bible by Ulphilas. The MS. from which this is taken is known from its place in the Wolfenbüttel Library as the *Codex Guelpherbytanus*. It was noticed first 1755 by Knittel, by whom a portion of the Gothic version was pub. 1762. These fragments were reprinted 1772, again 1805. The modern writing of the MS. consisted of the *Origenes* of Isidorus Hispalensis. A large addition to the text of Ulphilas was made 1817 by Mai and Castiglione, from palimpsests discovered in the Ambrosian Library at Milan; and the whole have since been combined into one ed. by Dr. Gabelentz, and finally by Dr. Massmann (4to, Stuttgart 1855). Some interesting Greek liturgical remains were edited by F. I. Mone (Frankfort 1850), from a P. discovered at Carlsruhe.

In Greek classical literature, also, we owe something to the labors of P. editors. From one of the Syriac MSS. above referred to, Dr. Cureton has edited large fragments of the *Iliad* of Homer, amounting in all to nearly 4,000 lines; and though all these were known before, yet the text is of utmost value as a source of criticism, being certainly of much greater antiquity than the very earliest known MSS. of the *Iliad*. A still larger and more original contribution to Greek classical literature was made by Mai in the 5th vol. of his *Scriptorum Veterum Nova Collectio* (Rome 1831–38). From a very large P. discovered in the Vatican Library, he has printed in this vol. copious fragments of almost all the Greek writers on Roman history—from the lost books of Polybius no less than 100 4to pp.; 130 pp. of Diodorus Siculus; 64 of Dionysius of Halicarnassus; 100 of Dion Cassius; together with considerable fragments of Appian, Iamblichus, Dexippus, Eunapius, and others. This is, perhaps, after the *De Republica* of Cicero, the most important accession to the existing store of classic learning which the palimpsests have hitherto supplied.

II. LATIN PALIMPSESTS.—(1) The earliest fragment of Latin literature printed from a P. original is the portion of the 91st book of *Livy* above referred to, pub. at Hamburg and also at Rome 1773. It was re-edited in a more complete form by Niebuhr 1820. (2) Of the Latin palimpsests edited by Mai, the earliest were some fragments of lost Orations of Cicero, from two different palimpsests in the Ambrosian Library at Milan; in the latter of which, the second writing consisted of the acts of the Council of Chalcedon. These Orations were published in two successive vols. 1814. (3) Eight Orations of Symmachus (1815). (4) The Comedies of Plautus, including a fragment of the lost play entitled *Vidularia* (1815). (5) The works of M. Corn. Fronto, together with the Epistles of Antoninus Pius, Lucius Verus, M. Aurelius, and others (1815). (6) The celebrated Dialogue of Cicero, *De Republica*, from a P. of the Vatican, the modern writing of which is the commentary of St. Augustine on the Psalms. There is none of Mai's publications which presents his critical abilities in so favorable a light as this precious volume, which appeared at Rome 1821. (7) Soon after the *De Republica*, he published another vol. from P. sources, the most important of whose contents were some fragments of ancient Roman law, which prepared the way for the more distinguished success of Niebuhr, who, in a P. of the library of Verona, recognized a portion of (8) the *Institutiones* of Gaius, and procured an accurate transcript for the press; printed Berlin 1820. The latest considerable Latin publication in this department is (9) *Gai Granii Liciniani Annalium quæ supersunt* (Berlin 1857), edited from a P. of the British Museum by the younger Pertz. This P., as above stated, is a thrice-written codex, the earliest and original contents being the *Annales* of Gaius Granius. The second writing was also in Latin, and the work is a grammatical treatise, of which the chapters *De Verbo* and *De Adverbio* are still legible. The most modern writing is Syriac, in the cursive character. Gaius Granius is a writer named by Microbius, of whom nothing else is known.

It will be gathered from the above that all the ancient works recovered by means of palimpsest MSS. are fragmentary, and one is naturally led to rate at a low value the result thereby obtained. But it must be remembered that, in some of the departments to which these fragments belong, every scrap, no matter how minute, has an independent value. So it is, e.g., in biblical remains—a single text may present a valuable reading, the merest fragment may throw light on an important critical question. In history, in like manner, a small fragment may disclose an interesting fact, or supply a significant commentary on facts otherwise ascertained. And as regards critical uses especially, it must not be forgotten that the obliterated text of the palimpsest MSS. mostly far exceeds in antiquity the very oldest known codices which we possess, and is, probably, second only in age to the papyri of Herculaneum.

The method of treating palimpsest MSS., with a view to deciphering their contents, has been fully described by different editors. Mai, after having washed the P. with an infusion of galls, exposed it to the light and air, and usually found this sufficient for his purpose. Peyron washed the parchment in water, afterward in dilute muriatic acid, and finally in prussiate of potash. A mixture compounded on this principle is called from its inventor, M. Gioberti, *Tinctura Giobertina*. Sometimes the same treatment does not succeed equally well on both sides of the parchment; the inner surface, from its softer texture, sometimes requiring a more active preparation. When the ink contained animal substances, as milk, or the blood of the cuttle-fish, Dr. Mone plunged the parchment in a close vessel filled with oil, which he heated to a temperature of 400° R. In the prefaces of Mai's vols. will be found many interesting facts illustrating the difficulties which attend this branch of literary labor.

PALIN-, prefix, *păl-in* [Gr. *palin*]: again; back.

PALINDROME, n. *păl'ĭn-drōm* [Gr. *palin*, back or again; *dromos*, a race—from *dramein*, to run]: word, verse, or sentence which is the same when read either forward or backward, e.g., *madam*. This kind of verse is very common in Latin; the following are examples:

Si bene te tua laus taxat sua lauté tenebis.
Et necat eger amor non Roma rege tacente,
Roma reges una non anus eger amor.

A Roman lawyer gets the credit of the following:

Si nummi immunis,

which Camden translates:

'Give me my fee, and I warrant you free.'

It is said that in the reign of Queen Elizabeth a certain lady of rank, having been compelled to retire from the court on account of some *fama*, the truth of which she denied, took for her motto:

Ablata at alba.
'Retired but pure.'

The English language has few palindromes, but one at least is inimitable. It represents our first parent politely introducing himself to Eve in these words:

'Madam, I'm Adam.'

Compare Henry B. Wheatley's book on *Anagrams* (1862).

PALING: see under PALE 2.

PALINGENESIA, n. *păl'ĭn-jĕ-nē'zhĭ-ă*, or **PALINGENESIS**, n. *păl'ĭn-jĕn'ĕ-sĭs* [Gr. *palin*, again; *gĕnĕsis*, a beginning, birth]: a new or second birth or creation; inherited evolution. **PAL'INGENET'IC**, a. *-ĕt'ĭk*, of or pertaining to.—*Palingenesia* is a term that appears to have originated among the Stoics, who employed it to denote the act of the Demiurgus, or Creator, by which, having absorbed all being into himself, he reproduced it in a new creation. The occurrence of the word in the New Test. (Titus iii. 5, where it is used to denote regeneration, the new birth of the soul) has given it a place in Christian theology, and divines have variously used it to express the resurrection of men, the new birth of the individual soul, and the restoration of the world to its perfect state, which it lost by the Fall—'the new heavens and the new earth, wherein dwelleth righteousness.' Naturalists have applied the term to designate the great geological changes which the earth has undergone, and the transformations in the insect kingdom, e.g., of caterpillars into butterflies, etc.

PALINODE, n. *păl′ĭn-ōd* [Gr. *palinōdĭă*, a recantation —from *palin*, again; *ōdē*, a song]: piece of poetry in which a poet retracts the invectives or sentiments contained in a former production. PAL′INO′DIST, n. *-ō′dĭst*, one who writes palinodes.—P., in the law of Scotland, is a peculiar practice by which, in actions for damages on account of slander or defamation, the pursuer may conclude not only for damages, but for P., i.e., a solemn recantation.

PALINURUM, *pâ-lē-nô′rŭm*, or CAPO PALINURO, *pâ-lē-nô′ro:* promontory on the Italian coast, in the dist. of Lucania, bordering the Tyrrhenian Sea; lat. 40° n., long. 15° 15′ e. Here, according to tradition, Palinurus, the pilot of Æneas, was buried, and his tomb, now in ruins, was built. Only a short distance from this point, two great naval disasters have occurred: a Roman fleet of 150 vessels was lost B.C. 253, and a large number of ships under the command of Octavius were destroyed B.C. 36.

PALINURUS, n. *păl-ĭ-nūr′ŭs* [L.]: in *myth.*, name of the pilot of Æneas; he was drowned just before the Trojan fleet arrived at Cumæ.

PALINURUS, n. *păl-ĭ-nūr′ŭs:* in *zool.*, rock-lobster; spiny-lobster; the single genus of the family *Palinuridæ.*

PALISADE, n. *păl′ĭ-sād*, or PALISADO, n. *păl′ĭ-sā′dō* [F. *palissade*, a stake, a hedgerow of trees—from It. *palizzata*—from L. *palus*, a pole or stake]: in *fort.*, a paling or barrier of pointed stakes of strong timber driven firmly into the ground: V. to inclose or defend by driving pointed stakes into the ground. PAL′ISA′DING, imp. PAL′ISA′DED, pp.—See FORTIFICATION (Stockade).

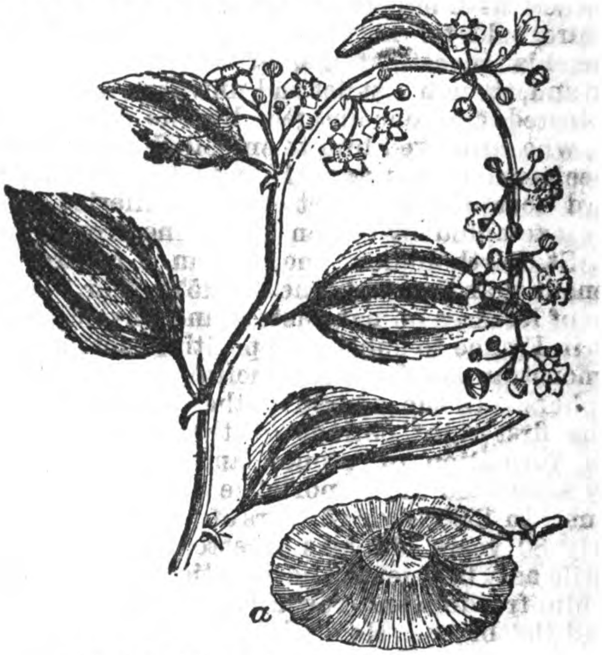
PALISANDER, *păl-ĭ-săn′dėr* (or PALISSANDER, *păl-ĭs-săn′dėr*), WOOD: continental European name for Rosewood (q.v.). By some of the French cabinet-makers the name *bois de Palisandre* is applied also to violet wood and to a kind of striped ebony.

PALISSY, *pâ-le-se′*, BERNARD: French potter, famous for his glass paintings and beautiful figured pottery: 1510–89; b. near Agen, present dept. of Lot-et-Garonne, France; of parents who were poor. In youth he was apprenticed to a potter. He made chemical researches for improvement of his art, and made many journeys through France and Germany for the same purpose; at the same time carrying on the business of a land-surveyor. An enamelled cup of 'Faience,' which he saw by chance, inspired him with the resolution to discover the mode of producing white enamel. Neglecting all other labors, he applied himself to investigations and experiments patiently through 16 years—a pathetic search, for all the potters of n. Italy knew the secret of the white enamel, and from them he might have learned the process which he so laboriously sought. He had by this time exhausted all his resources, and for want of money to buy fuel was reduced to the necessity of burning his household furniture piece by piece; his neighbors laughed at him, his wife overwhelmed him with reproaches, and his starving family surrounded him crying for food; but in spite of all these discouragements, he persisted in the search, which in the end brought success. A few vessels adorned with figures of animals, colored to represent nature, sold for high prices, and enabled him to complete his investigations, after which he became famous; and, though a strict and unwavering Huguenot, was protected and encouraged by the king and the nobility, who employed him to embellish their mansions with specimens of his art. He was lodged on ground afterward occupied by a part of the Tuileries, and was specially exempted by Queen Catharine from the massacre of St. Bartholomew, more from a regard to her own benefit than from kindness. 1575, Mar., he began a course of lectures on nat. history and physics, and was the first in France to substitute positive facts and rigorous demonstrations for the fanciful interpretations of philosophers. In the course of these lectures, he gave (1584) the first right notions of the origin of springs and the formation of stones and fossil shells, and strongly advocated the importance of marl as a fertilizing agent. In 1588, after 45 years of service of the court, P., nearly 80 years old, was arrested and thrown into the Bastile as a Huguenot and heretic: King Henry III. offered him freedom and reward for recantation; but P. disdained the bribe. He died, however, before his sentence was pronounced.

P. left a collection of objects of nat. history, the first that had been formed in France. His works are now almost beyond price, and his ornaments and arabesques are among the most beautiful of the 'renaissance.' His writings were on religion, agriculture, and nat. philosophy; they are highly esteemed. As a sincere, faithful, and courageous man, he was no less eminent than as an artist. See Morley's *Palissy the Potter*.

PAL'ISSY-WARE: see PALISSY, BERNARD.

PALIURUS, *pă-lĭ-ū'rŭs* or *păl-ĭ-ūr'ŭs:* genus of trees and shrubs of nat. order *Rhamnaceæ*, nearly allied to *Zizyphus* (see JUJUBE), but very different in the fruit, which is dry, orbicular, and girded with a broad membranous wing. *P. aculeatus* is often called CHRIST'S THORN, and, by the Germans, JEWS' THORN (*Judendorn*), from an imagination that it supplied the crown of thorns with which our Saviour was crowned. It is a deciduous shrub or low tree, with slender, pliant branches and ovate, 3-nerved leaves, each of which has two sharp spines at the base, one straight and the other re-curved. It is a native of the countries around the Mediterranean, of India, and many parts of Asia. It is used often for hedges in Italy and other countries; its sharp spines and pliant branches admirably adapting it for this purpose. The fruit has a singular appearance, being flat and thin, attached by the middle to the foot-stalk, the middle being raised like the crown of a hat, while the expansion resembles the brim. The seeds are sold by the druggists of the east, and are used medicinally, but their qualities are doubtful. This shrub is common in shrubberies in England, being very ornamental when in flower, but the fruit does not ripen.



Christ's Thorn (*Paliurus aculeatus*):
a, ripe fruit.

PALK STRAIT, *pawk*, or PALK'S PAS′SAGE, *pawks*: northern portion of the passage between the s. coast of Hindustan and the island of Ceylon: its southward continuation is the Gulf of Manaar (q.v.). It is from 40 to 80 m. in width, and 80 m. long. It is so shallow—in some places no more than two fathoms in depth—that it cannot be navigated in safety by large vessels. There are several pearl fisheries.

PALL, n. *pawl* [L. *palla*, a long and wide upper garment worn by Roman ladies; *pallĭŭm*, a coverlet, a cloak: AS. *pœll*, a purple cloth: W. *pall*, a mantle: Bret. *pallen*, a coverture: Gael. *peall*, a covering]: ensign or mantle of state for a high ecclesiastic (see PALLIUM). A pall is also an ample covering of black velvet or other stuff cast over a coffin borne to burial.—In the Rom. Cath. Chh., a pall is one of the coverings used at the altar in celebration of the mass. Primitively, as appears from Optatus and other early writers, the altar was covered with a large linen cloth—called by the Latins *pallium*, and by the Greeks *eileton*—the extremities of which were folded back, to cover the bread and wine prepared for the celebration of the eucharist. In later times, a separate covering was employed for the sacramental chalice, to which latter the name pall is now reserved in the Rom. Church. The modern Roman pall is a square piece of linen cloth

—sometimes limber, sometimes made stiff by inserting pasteboard—sufficiently large to cover the mouth of the chalice. The upper surface is often of silk embroidered, or of cloth of gold. The surface in contact with the chalice must always be of linen. In *her.*, a figure representing the pallium, the upper part of a saltire joined to the lower part of a pale; used in the arms of ecclesiastical sees: V. to cover or invest. Pallial, a. *păl'ĭ-ăl*, pertaining to a pall or mantle. Pall-bearers, the broad ribbons attached to a funeral pall and held by relatives or friends; also those who hold the ribbons or the ends of the pall in the funeral procession, or who walk by the side of the coffin—usually the most distinguished or most intimate friends of the deceased, but not related to him by blood. Pallial impressions, the impressions left by the mantle on the interior of bivalve shells.

PALL, n. *pawl* [L. *palus*, a pole or stake]: in *shipbuilding*, strong short pieces of iron or wood so placed near the capstan or windlass as to prevent its recoil or giving way.

PALL, v. *pawl* [W. *pallu*, to fail; *pall*, loss of energy: comp. Ir. *spaillead*, a check, abuse: another form of *fail* or *fall*]: to cloy or satiate so as to lose piquancy and relish; to weaken or impair; to dispirit; to grow vapid; to lose strength or taste. Pall'ing, imp. Palled, pp. *pawld:* Adj. cloyed; weakened.

PALLA, n. *păl'lă* [L.]: in *anc. Rome*, the long and wide upper garment worn by Roman ladies.

PALLA'DIAN ARCHI'TECTURE: see Palladio.

PALLADIO, *pâl-lâ'de-o*, Andrea: famous Italian architect: 1518, Nov. 30—1580, Aug. 6; b. Vicenza. After having studied with the greatest care the writings of Vitruvius and the monuments of antiquity at Rome, he settled in his native city, where he acquired reputation first by his restoration of the Basilica. Pope Paul III. then invited him to Rome, to supervise the works at St. Peter's; but the death of the pope before P.'s arrival, caused his return home. He was employed many years in constructing numerous buildings in Vicenza and the neighborhood. His style, known as the Palladian, is a composite, characterized by great splendor of execution and justness of proportion; and it exercised immense influence on the architecture of n. Italy. His principal works are the Rotonda Capra, outside Vicenza; the Palazzo Chiericado and the Palazzo Tiene, in the city; the Palazzo della Ragione, deemed by some critics his finest work in Vicenza; the Palazzo Barbara, at Maser, in the Trevigiano; the Teatro Olympico, at Vicenza (his last work); the Palazzo at Montagnana, for Francesco Pisana; the churches of San Giorgio Maggiore and Il Santissimo Redemptore at Venice; the atrium and cloister at the convent Della Carità, and the façade of San Francesco della Vigna, in the same city. His villa of Capra has been often imitated. P. died at Vicenza. He wrote a work on architecture, which is highly prized; best ed. Vicenza, 4 vols., 1776.

PALLADIUM.

PALLA'DIUM [fr. *Pallas*], (sym. Pd, at. wt. 106·6, sp. gr. 12·1): one of the so-called noble metals, a rare metal of steel-gray color, found in very small grains in auriferous and platiniferous sand, and in its color and ductility closely resembling platinum. It is not fusible in an ordinary wind-furnace, but melts at a somewhat lower temperature than platinum; and when heated beyond its fusing-point, it volatilizes in green vapor. It undergoes no change in the open air at ordinary temperatures; but at a low red heat it becomes covered with a purple film, owing to superficial oxidation. It is soluble in nitric and iodic acids, and in aqua regia. It combines readily with gold, which it has the property of rendering brittle and white. When alloyed with twice its weight of silver, it forms a ductile compound, used in construction of small weights; Prof. Miller states that it 'has been applied in a few cases to the construction of graduated scales for astronomical instruments, for which, by its whiteness, hardness, and unalterability in the air, it is well adapted;' its scarcity must, however, prevent its general use for this purpose. It was discovered 1803 by Wollaston in the ore of platinum, of which it seldom forms so much as 1 per cent. Another source of this metal is the native alloy which it forms with gold in certain mines in Brazil, and which is termed *ouro poudre;* and it is from this alloy that the metal is chiefly obtained. P. forms with oxygen a protoxide, PdO, the base of the salts of the metal; a dioxide, PdO_2; and, according to some chemists, a suboxide, Pd_2O. On exposure to sufficient heat, these compounds give off their oxygen, and yield the metal. The salts of the protoxide are of brown or red color. **PALLADIOUS**, a. *păl-lā̆'dĭ-ŭs*, and **PALLA'DIC**, a. *-lā̆'dĭk*, applied to certain compounds of the metal palladium.

PALLADIUM, n. *păl-lā̆'dĭ-ŭm* [Gr. and L. *Pallas*, Minerva, the goddess of war and wisdom]: among the *anc. Greeks and Romans*, an archaic wooden image of Pallas, a goddess generally identified with Athene or Minerva, on the careful keeping of which in a sanctuary the public welfare was believed to depend. The P. of Troy particularly is celebrated. According to the current myth, it was thrown down from heaven by Zeus, and fell on the plain of Troy, where it was picked up by Ilus, founder of that city, as a favorable omen. In course of time, the belief spread that the loss of it would be followed by the fall of the city; it was therefore stolen by Odysseus and Diomedes. Several cities afterward boasted of possessing it, particularly Argos and Athens. Other accounts, however, affirm that it was not stolen by the Greek chiefs, but carried to Italy by Æneas; and the Romans said that it was preserved in the temple of Vesta, but so secretly that even the Pontifex Maximus might not behold it. All images of this name were somewhat coarsely hewn out of wood.—P. is used figuratively to denote any particular law or privilege regarded as the safe-guard of a people's liberties.

PALLADIUS, *păl-lă'dĭ-ŭs,* Rutilius Taurus Æmilianus: Roman author: 4th c. after Christ, under Valentinian and Theodosius. He wrote a work, *De Re Rustica* (On Agriculture), 14 books, the last of which is a poem of 85 elegiac couplets. It is, in a literary and grammatical view, full of faults; but as it was a complete calendar of Roman agriculture, it was very useful for its time, and was read and followed during the middle ages. P. borrowed largely from his predecessors. The best ed. is that by J. G. Schneider in *Scriptores Rei Rusticæ Veteres Latini* (4 vols. Leip. 1794).

PAL'LAS: one of the smaller planets.—Also in anc. mythology, a goddess (see Minerva).

PALLAS, *păl'lâs,* Peter Simon: traveller and naturalist: 1741, Sep. 22—1811, Sep. 8; b. Berlin, where his father was a physician. He studied medicine, nat. history, and other branches of science, at the universities of Berlin, Göttingen, and Leyden. He gained high reputation by the publication of *Elenchus Zoophytorum* (Hague 1766), a work still much valued; *Miscellanea Zoologica* (Hague 1766); and *Spicilegia Zoologica* (2 vols. Berlin 1767–1804). Empress Catharine invited him, 1768, to St. Petersburg, where honors were conferred on him. Subsequently he was appointed naturalist to a scientific expedition in Siberia, there to observe the transit of Venus. P. spent six years on this journey, exploring the Ural Mountains, the Kirghis steppes, great part of the Altaian range, and the country around Lake Baikal as far as Kiachta, great part of Siberia, and the steppes of the Volga, returning to St. Petersburg 1774, with extraordinary treasure of specimens in nat. history, nucleus of the Museum of the Acad. of St. Petersburg. His travels (*Reisen durch verschiedene Provinzen des Russ. Reichs*) were published at St. Petersburg (3 vols. 1771–76); followed by *Sammlung historischer Nachrichten über die Mongol. Völkerschaften* (2 vols. St. Petersb. 1776–1802), and *Neue nordische Beiträge zur physikalischen und geographischen Erd- und Völkerbeschreibung, Naturgeschichte und Oekonomie* (6 vols. St. Petersb. 1781–93). Without positively neglecting any branch of nat. history, he then gave his attention particularly to botany; and his magnificent *Flora Rossica* (St. Petersb. 1784–88), a work which he was not able to complete, and *Species Astragalorum* (14 parts, Leip. 1800–04), were among the results of his studies. He published also *Icones Insectorum præcipue Rossiæ Sibiriæque Peculiarium* (Erlangen 1781, 83, and 1806); and contributed to a glossary of all the languages of the Russian empire, pub. St. Petersburg. As he wished to live in the Crimea, Empress Catharine presented him with an estate in the finest part of that peninsula, where he resided usually from 1796. His *Travels in the South of Russia* were published 1799 (2 vols. Leip., with vol. of plates). After the death of his wife, he went to Berlin, where he died. P.'s large and valuable work on the Fauna of Russia has not yet been published.

PALLAVICINO, *pâl-lâ-ve-chē′no* (or **Pallavicini**, *-nē*), Pietro Sforza, Cardinal: Italian historian: 1607, Nov. 20—1667, June 5; b. Rome; son of Marquis Alessandro P. of Parma. Much to the disgust of his father, he took priest's orders, and held several important ecclesiastical appointments during the pontificate of Urban VIII. In 1637 he became a member of the Jesuit Soc., and was created cardinal 1657 by Pope Alexander VII. He died at Rome. P. was a fine scholar, and often presided in the famous Roman acad. of the *Umoristi*. The best known of all his writings is *Istoria del Concilio de Trento* (Rome 1656–7), intended as a reply to the still more celebrated and liberal, though by Rom. Catholics deeply suspected, work of Paul Sarpi. Among his works are: *Vindicationes Soc. Jes.* (Rome 1649); *Arte della Perfezione Cristiana—I Fasti Sacri* (the unpublished MS. is in the library of Parma); *Ermengilda*, a tragedy (Rome 1644); *Gli Avvèrtimenti Grammaticali* (Rome 1661); *Trattato dello Stilo e del Dialogo* (Rome 1662); and *Lettere* (Rome 1668).

PALLEE, *pâl′lē:* town of Rajputana, in Judpore; on the right bank of a branch of the Luni river, lat. 25° 48′ n., long. 73° 24′ e. It is an entrepôt for the opium sent from Malwa to Bombay, and is the seat of extensive commerce. It imports European manufactured goods extensively. Pop. estimated about 50,000.

PALLESCENT, a. *păl-lĕs′ĕnt* [L. *palles′cens* or *pallescen′tem*, turning pale]: in *bot.*, growing pale.

PALLET, n. *păl′ĕt* [F. *palette;* It. *paletta*, a fire-shovel —from L. *pala*, a spade (see Palette)]: an instrument, generally made of a squirrel's tail, used in working gold-leaf; a certain piece of the mechanism of a watch; among *potters*, a shaping-tool.

PALLET, n. *păl′ĕt* [prov. F. *paillet*, a heap of straw—from F. *paille*, straw—from L. *palĕă*, chaff]: a small and humble bed.

PALLET, n. *păl′ĕt* [dim. of *pale*]: in *her.*, a diminution of the pale, being only one-half of it in breadth.

PALLIAL: see under Pall 1.

PALLIASSE, n. *păl-yăs′:* see Paillasse.

PALLIATE, v. *păl′lĭ-āt* [L. *pallĭātus*, cloaked—from *pallĭŭm*, a cloak or mantle: It. *palliato*, cloaked, disguised]: to cover with excuses, as with a *cloak* or *mantle;* to soften or lessen, as an offense, by favorable representations; to lessen or abate, as a disease; to ease without curing. **Pal′liating**, imp. **Pal′liated**, pp. **Pal′lia′tion**, n. *-ā′shŭn*, the act of palliating; the state of being palliated; extenuation by favorable representations. **Pal′liative**, a. *-ā-tĭv*, serving to soften or lessen by favorable representations; mitigating, as disease or suffering: N. that which extenuates or mitigates.—Syn. of 'palliate': to extenuate; hide; cloak; cover; conceal; lessen; abate; mitigate.

PALLID, a. *păl'lĭd* [L. *pallĭdus*, pale—from *pallĕō*, I am pale]: pale; wan; deficient in color. PAL'LIDLY, ad. -lĭ. PAL'LIDNESS, n. *-nĕs*, paleness; wanness.

PALLIOBRANCHIA'TA: see BRANCHIOPODA.

PALLISER, *păl'ĭs-ėr*, Sir WILLIAM: 1830, June 18—1882, Feb. 6; b. Dublin, Ireland. He graduated from the Staff College, Sandhurst; entered the rifle brigade as an ensign 1855: 3 years later was connected with the 18th hussars; was promoted capt. 1859, major 1864, and sold his commission and left the army 1871. Among his inventions were numerous improvements in constructing fortifications and arming war vessels, a machine for changing smooth-bore cannon into rifled guns, thereby wonderfully increasing their efficiency, and an improved method of rifling heavy guns of wrought-iron. His greatest fame was secured by the invention of the P. projectiles for piercing the plates of armor-clad ships. He was knighted 1873 and received the cross of the Commander of the Crown of Italy 1875.

PALLIUM, n. *păl'lĭ-ŭm* [L. *pallĭŭm*, a cloak (see PALL 1)]: name given in the Rom. Cath. Church to one of the ecclesiastical ornaments worn by the pope, by patriarchs, and by archbishops. Its use is held by Rom. Catholics to have descended from a very early period. It is worn by the pope at all times, as a symbol of his reputed universal and abiding jurisdiction. By archbishops it cannot be worn until it has been solemnly asked for and granted by the pope, and even then only during the solemn service of the great church festivals, and on occasions of the ordination of bishops or of priests, and similar acts of the archiepiscopal order. The P. is now a narrow annular band of white woolen web, about three inches wide, upon which black crosses are embroidered, which encircles the neck of the abp., and from which two narrow bands of the same material depend, one falling over the breast, the other over the back of the wearer. Its material is the subject of much care and ceremonial: it is made wholly or in part from the wool of two lambs, blessed annually on the festival and in the church of St. Agnes. During the night of the vigil of the feast of St. Peter and St. Paul, the *pallia* made of this wool are placed on the altar above the tomb of these apostles, and on the feast of St. Peter and St. Paul are delivered by the pope to the sub-deacon, whose duty it is to keep them in charge. Every new archbishop, within three months of his consecration, is obliged to apply in person or by proxy to the pope for the P.; nor is it lawful for him, until he shall have received it, to exercise any act of what is properly archiepiscopal, as distinguished from episcopal, jurisdiction; e.g., he cannot call a *provincial* synod. The P. cannot be transferred from one abp. to another, but must be received direct from the pope. On the abp.'s death, his P. is interred with him. Its use is held to symbolize the office of the 'good shepherd' bearing the lost sheep on his shoulders, and is connected by some writers with the vesture of the Jewish high-priest, Ex. xxviii. 4. In the mediæval church, the granting of the P. to abps. was one of the chief occasions of the tribute paid by the national churches to the support of the great central office and dignity of the papacy. In some sees, e.g., those of the great prince-bishops of the Rhine, the tribute was as much as 20,000 florins. Rom. Catholics, however, maintain that this tribute was not a *payment* for the P., but an *offering* to the holy see, made on occasion of the grant of that emblem of jurisdiction.—*Pallium* in *zool.* is the fleshy covering lining the interior of the shells of bivalves.

PALL-MALL, n. *pĕl-mĕl′* [OF. *pale-maille*, a game similar to the modern croquet: O. It. *pallamaglio*—from It. *palla*, a ball, and *maglio*, a hammer: F. *mail:* L. *malleus*]: a certain game in which a *ball*, with the stroke of a *mallet*, is driven through a series of iron rings: a street in London, so called from having once been a place for playing the game. MALL, a public walk in St. James's Park: see MALL: BALL.

PALLOR, n. *păl′ėr* [L. *pallor*, paleness (see PALE 1)]: paleness.

PALM, n. *pâm* [Gr. *palămē;* L. *palma;* W. *palf;* AS. *folm*, the flat of the hand: F. *paume*, the palm of the hand: L. *palpārĕ;* Icel. *falma*, to grope, to feel for with the hands]: the flat open front of the hand; the broad triangular part of an anchor at the extremity of each arm; a measure of length of three inches (see below); a sailmaker's thimble, so called from being held in the palm of the hand: V. to touch with the hand; to conceal in or by the palm of the hand; to impose by fraud, usually followed by *off*, as, to palm *off;* to stroke with the hand. PALMING, imp. *pâm′ĭng*, imposing upon by fraud; cheating. PALMED, pp. *pâmd*. PALMAR, a. *păl′mâr*, of the breadth of the hand; of or relating to the palm.

PALM, n. *pâm* [L. *palma*, the palm, a tree with broad-spreading leaves like the palms of one's hands—the Italian palm being one of the palmate species, and not pinnate like the date-palm: F. *palme*, the branch of a palm-tree]: tree of hot climates and of many species, branches of which in some countries were borne as tokens of victory or rejoicing; a symbol or evidence of superiority or success; the *Palmæ* or palm tribe (see PALM). PALMACEOUS, a. *păl-mā'shŭs*, belonging to the palm tribe. PALMAR, a. *păl'mâr*, of or relating to the palm. PALMER, n. *pâm'ėr*, a pilgrim carrying a palm-branch in sign of his return from the Holy Land (see below). PALMER-WORM (see below). PALMY, a. *pâm'ĭ*, bearing palms; flourishing; prosperous. PALMATE, a. *păl'māt*, or PAL'MATED, a. *-māt'ĕd* [L. *palmātus*, marked with the palm of a hand]: in *bot.*, having the shape of the open hand with the fingers apart, as in some leaves; entirely webbed. PALMA CHRISTI, n. *păl'mă kris'tĭ* [L the palm-tree of Christ]: the Castor-oil (q.v.) Plant. PALM-OIL (see OIL PALM). PALM-WINE, the fermented juice of the flowers and stems of the cocoa-nut tree, also of the oil palm, and of some other species. Its name in India is *toddy*. In Africa, scarcely any other fermented liquor is made. PALMACITES, n. plu. *păl'mă-sīts*, a general term for any fossil stem, leaf, or fruit which exhibits some analogy or resemblance to any one of the existing palms. TO BEAR THE PALM, to be the best; to come off victorious.

PALM, n. *pâm* [Low Ger. *palme*, a bud, a catkin of the willow: Ger. *palmen*, the buds or eyes of the vine: Fin. *palmu*, the catkin of willow—from *palmikko*, a lock of hair]: the yellow catkin of the willow, the branches of which, from the name, are carried on Easter Sunday to represent the palm-branches of the East. *Note.*—The three preceding groups are connected, as may be seen from the roots, yet it has been thought better to separate them as has been done, for greater distinctness and easier apprehension.

PALM, *pâm* (*Palmæ* or *Palmaceæ*): natural order of endogenous plants, not excelled in importance by any order in the vegetable kingdom except Grasses. They are generally tall and slender trees, often of gigantic height, without a branch, and bearing at the summit a magnificent and graceful crown of very large leaves. The stem is sometimes, however, of humble growth, and more rarely it is thick in proportion to its height; sometimes, but rarely, it is branched, as in the Doom (q.v.) P.; and sometimes, as in Rattans (q.v.), it is flexible, and seeks support from trees and bushes, over which it climbs in jungles and dense forests, clinging to them by means of hooked spines. Some of the species with flexible stem attain prodigious length, ascending to the tops of the highest trees, and descending again. Rumphius asserts that they are sometimes 1,200 or even 1,800 ft. long. Whatever the form or magnitude of the stem of a P., it is always woody, and the root is always fibrous. It is only toward its circumference, however, that the stem is hard, and there in many species it is extremely hard; but the centre is soft, often containing when young much starch (sago), and sometimes filled when old with a mass of fibres which can be separated without difficulty. Concerning the structure of the stem, see ENDOGENOUS PLANTS. The stem is generally marked externally with rings or scars, where former leaves have been attached; sometimes it is rough with the remaining bases of the leaves, and part of it is sometimes covered with their fibrous appendages. No other plants have leaves so large as many of the palms; the largest of all are those of some of the fan-leaved palms, but there are palms with pinnate leaves 50 ft. long and 8 ft. broad, and undivided leaves are seen 30 ft. long by 4 or 5 ft. broad. There are also small palms; and palms with flexible stems, which have small leaves. The number of the large leaves which form the crown of even the most magnificent P. is never great. Whatever the size or form of the leaves, they are always stalked, the stalk being often in dimensions equal to a large bough of a great oak. The leaves are commonly pinnated, the number of pinnules or leaflets being often very great; but about one-sixth of the whole number of known species of P. have fan-shaped leaves, and a few species have undivided leaves. The leaves are in all cases persistent, falling off in succession only as the P. advances in growth, and new ones are formed at the summit. The flowers are sometimes hermaphrodite, sometimes unisexual; the same tree having sometimes male, female, and hermaphrodite flowers, while other species are monœcious and others diœcious. The perianth has six divisions, three outer and three inner; there are generally six, rarely three, stamens; the ovary is composed of three carpels, distinct or united, each with one cell, containing one ovule. The flowers are small, but often produced in dense masses of very striking appearance. Humboldt reckons the number of flowers on a single P. (*Alfonsia amygdalina*) as about 600,000, and every bunch of the Seje P. of the Orinoco consists of about 8,000 fruits. The flowers are produced on scaly spadices, often much branched, and inclosed before expanding in leathery or wooden spathes, which are often very large and sometimes open by bursting with a loud explosion. The flowers of some palms emit a powerful odor, which attracts multitudes of insects. The fruit is sometimes a kind of berry, sometimes a drupe, with either fleshy or fibrous covering; and sometimes contains a very hard and bony nut. The fruit is sometimes only the size of a pea or cherry; sometimes, notwithstanding the smallness of the flowers, it is very large, of which the cocoa-nut is a familiar example.

Palms are natives mostly of tropical countries, being found almost everywhere within the tropics, and forming perhaps the most striking characteristic of tropical vegetation. Tropical parts of America particularly abound in them, producing a far greater number of species than any other part of the world. A few species are found in temperate regions; one species only, *Chamærops humilis*, being a native of Europe, and extending as far n. as lat. 44°, while the n. limit of the P. in Asia is about lat. 34°, and in N. America lat. 35° (see PALMETTO). In S. America, the s. limit of the P. is lat. 36°; in Australia, lat. 35°; in Africa, no native species is found further s. than lat. 30°; but in New Zealand, one species extends as far s. as lat. 38° 22′. Some of the species, however, in tropical America, grow in mountain regions bordering on the limits of perpetual snow. Some palms have very narrow geographical limits; the cocoa-nut P. is by far the most extensively distributed species. Some, like the cocoa-nut, grow in maritime, others in inland, districts; some grow on dry and sandy ground, others in the richest alluvial soil, and some in swampy situations; some in open districts, others in dense forests. Some species are usually found singly, some in groups; some even cover tracts of country in which no other tree appears.

The uses of the P. are many and various; there is almost no species incapable of some use. Tribes in the lowest grade of civilization depend almost entirely on particular species of P., e.g., the cocoa-nut P., for supply of all their wants. The fruit of some species is eaten; sometimes the fleshy part of the fruit, sometimes the kernel of the nut. The importance of the date and the cocoanut needs only to be alluded to; but in this respect they far excel the fruits of all other palms. A grateful beverage is made from the fruit of some palms (see ASSAI), consisting simply of a mixture of the pulp with water; but a kind of wine also can be obtained by fermentation (see DATE). A kind of beverage more generally used is the sap of palm-trees, either fresh or fermented (*palm-wine* or *toddy*), from which also a kind of spirits called Arrack (q.v.) is obtained by distillation; while from the fresh sap, boiled down, sugar is obtained—the *jaggery* of the E. Indies. The sap of various species of P. is collected and used for these purposes, and that of many others is probably not less suitable. The pulp of the fruit of some species, and the kernel of others, yield bland fixed oil useful for various purposes. See OIL PALM: COCOA-NUT. The soft and starchy centre of the stem of some palms affords a very important and abundant article of food: see SAGO. The terminal bud, or *cabbage*, of some species is boiled for the table; and though the taking of the bud is death to the tree, this is little regarded where vegetation goes on with a rapidity and luxuriance unknown in colder parts of the world. The young sprouts arising from the seeds of palms, when they have begun to vegetate, are another esculent of tropical countries. From the stems of some species of P., as the Wax P. (q.v.) of the Andes, and from the leaves of some, as the Carnahuba P. (q.v.), wax is obtained, used for the same purposes as bees-wax. The wood of palms is used in house-building, and for many other purposes; some affording very hard and beautiful wood for ornamental work, while others are suitable only for coarse purposes. The great leaf-stalks also are used for some of the purposes of timber. The stems of the most slender species are used for walking-sticks, etc., and, split or unsplit, for wicker-work: see RATTAN. The leaves of many palms are used for thatching houses. The spathes of some species are used as vessels or bags. The fibres of the leaf, the fibres connected with the leaf-stalk, the fibres of the rind of the fruit, and the fibres of the stem of different kinds of P. are used for making cordage, mats, nets, cloth, etc. The most important of these fibres are Coir (q.v.) or Cocoa-nut Fibre, Gomuto (q.v.) or Ejoo Fibre, and Piassaba (q.v.). The coarsest fibres are employed as bristles for making brushes, etc. Stripes of the delicate epidermis of the young unopened leaves of some S. American palms are twisted, and so used for making a kind of thread; hammocks made of which are highly valued: see ASTROCARYUM. The leaves of the Palmyra P. and Talipot P. are used in parts of the East for writing upon, an iron style being employed instead of a pen. One of the kinds of the resinous substance called *Dragon's Blood* is obtained from the fruit of a P. The Betel (q.v.) Nut, abounding in catechu, is the fruit of a P. The fruit of many palms is very acrid. The ashes of the fruits of some American species are used by the Indians as a substitute for salt, probably on account of potash, or some salt of potash, which they contain; and much potash may be obtained from the stems and leaves of palms. Vegetable Ivory (q.v.) is the kernel of the fruit of a P.; and somewhat similar to it in quality is the Coquilla Nut (q.v.). But a complete enumeration of the uses to which palms and their products are applied is almost impossible.

For some more important species of P., see separate titles. About 500 species are known; but it is probable that many are still undescribed. The most complete work on the P. is the monograph by Martius, *Genera et Species Palmarum* (3 vols. large folio, Munich 1823–45), a magnificent work, with 219 colored plates; but many new species have been discovered since its publication.

The cultivation of palms in hothouses is attended with great expense. Separate houses are allotted to them in a few gardens, of which the greatest is that at Kew, England. A very fine palm-house has been erected in the Botanic Garden of Edinburgh. Palms are cultivated in hothouses merely as objects of interest and taste, never for their fruit or any other product.

PALM: measure of length, taken originally from the width of the hand, measured across the joints of the four fingers. In Greece, it was known as *palaistē*, and was reckoned at 3 inches, or $\frac{1}{6}$ of a cubit, their standard unit. The Romans adopted two measures of this name —one was the Greek *palaistē* and was called *palmus minor;* the other, introduced in later times, was called *palmus major* or *palma*, and was taken from the *length* of the hand, being therefore usually estimated at three times the length of the other. At the present day, this measure varies in a most arbitrary manner, being different in each country, and occasionally varying in the same country. The English P., when used at all, which is seldom, is considered to be the fourth part of an English ft., or 3 inches. The following is a list of the most common measures to which the name P. is given:

		Value in Eng. inches.
Greek *palaiste*, ...	=	3·03375
Roman *palmus*, **or lesser palm**, . . .	=	2·9124
" *palma*, or greater palm, . . .	=	8·7372
English palm (1-4 of a foot), . . .	=	3·0000
Hamburg palm (1-3 of a foot), ...	=	3·7633
Amsterdam 'round' palm, ...	=	4·1200
" 'diameter' palm, ...	=	11·9687
Belgian palm, **Lombard** palm, } properly the *decimetre*,	=	3·9371
Spanish palm, or *palmo major*, ...	=	8·3450
" " , or *palmo minor*, ...	=	2·7817
Portuguese palm, or *palmo de Craveira*,	=	8·6616

In Germany and the Low Countries, the P. is generally confined to wood-measurement: in Portugal it was formerly the standard of linear measure.

PALM, *pâm*, **JOHANN PHILIPP**: 1766–1806; b. Schorndorf: bookseller of Nuremberg, victim of Napoleonic despotism in Germany. In the spring of 1806, a pamphlet, *Deutschland in seiner tiefsten Erniedrigung* (Germany in Its Deepest Humiliation), which contained some bitter truths concerning Napoleon and concerning the conduct of the French troops in Bavaria, was sent by P.'s firm to a bookseller in Augsburg, in the ordinary course of trade, and, as P. to the last moment of his life averred, without any regard, on his part, to its contents. Napoleon's police traced it to the shop in Nuremberg. Later, P. was arrested and examined before Marshal Bernadotte, whose adjutant represented his arrest as the consequence of direct orders from Paris. An extraordinary court-martial at Braunau, whither he was removed, condemned him to death, without any advocate being heard in his defense. All intercession was in vain: Gen. St. Hilaire declared that the orders of the emperor were positive; and the sentence was executed at 2 o'clock on the same day on which it was pronounced. Subscriptions were raised for the family at St. Petersburg, in England, and in several German towns. Some French writers have endeavored to throw the blame of this murder on Marshal Berthier, instead of Napoleon.

PAL'MA: island: see CANARIES.

PALMA, *pâl'mâ:* capital of the island of Majorca (q.v.) and of the province of Baleares; on the s.w. coast of the island, on the Gulf of P., which, between Capes Figuera and Blanco, is 18 m. long, and extends 12 m. inland. The city is surrounded by orange plantations, and is walled and fortified. The houses, some of which are of marble, are mostly of Moorish architecture, and a number of the streets are wide and regular. It is the see of a bishop, and contains a Gothic cathedral, simple but beautiful in style, and with a spire which, from its delicate and airy construction, is called the Angel's Tower. Besides other ecclesiastical edifices, the town contains an Exchange—a beautiful and ornate structure in Germano-Gothic—the governor's palace, an acad. of medicine and surgery, and a large number of excellent educational institutions, including three *colegios*. In the port, a mole, 500 yards in length, runs out from the bastions facing the s.; and on each side of it are ship-building yards, for construction of the swift lateen vessels well known in the Mediterranean. The port is small. The first railway in Majorca was opened from P. to Inca 1875. Wool, silk, and the cordage for the Spanish navy are manufactured. Though one of the chief marts of Europe in the 13th c., P. now has little commerce. Pop. 58,200.

PAL'MA, Jacopo: Italian artist: about 1490–1538; b. Lerinatta, near Bergamo; known as 'the elder,' in distinction from his nephew. He studied painting at Venice, and early rose to distinction. His works are numerous, and specimens are found in the principal galleries of England and the continent. They are remarkably graceful and are greatly admired for beauty and delicacy of coloring. Among his most famous pictures are *The Three Graces*, the *Adoration of the Magi*, and the *Holy Family*. Of these the first named is at Dresden, the second is an altar-piece at Venice, and the last is at Vicenza.

PAL'MA (since 1861, Palma di Montechiaro, *pâl'mâ dē mōn-tā-kē-â'rō*): town of Sicily, province of Girgenti, 14 m. s.e. of the town of Girgenti, near the s.w. coast. It is entirely modern, its foundation dating from 1637. There is a trade in almonds, dried fruits, soda, wine, and sulphur. Pop. (1881) 11,702.

PALMARY, a. *păl'mă-rĭ* [L. *palmarius*, pertaining to palms (see under Palm 2)]: pertaining to a palm; worthy of the palm, as evidence of superiority or success, as in Palmary instance, a pre-eminent instance, in allusion to the use of palm-branches in anc. times as symbols and evidence of superiority or success, the Romans giving the victorious gladiator a branch of the palm-tree. Palmary truth, a pre-eminent or victorious truth.

PALMAS, *păl'mas* or *pâl'mas*, Cape: high point of land, marked with a light-house, the s. extremity of Liberia, on w. coast of Africa; lat. 4° 22′ n., long. 7° 44′ w. The name is applied also to that region which, under the appellation Maryland, is one of the states of the Liberian republic. Colored emigrants were sent there 1834 by the Md. Colonization Soc. The American Prot. Episc. Church supports a missionary bp. of Cape P. and parts adjacent.

PALMATE, PALMY: see under Palm 2.

PALMATIFID, a. *păl-măt′ĭ-fĭd* [L. *palma*, the palm of the hand; *findo*, I cleave, *fĭdī*, I have cleft]: in *bot.*, applied to a leaf divided so as to resemble a hand—the divisions extending about half-way toward the base.

PALMATIPARTITE, a. *păl′măt-ĭ-pâr′tīt* [L. *palmātus*, marked with the palm of a hand; *partitus*, divided]: in *bot.*, applied to a simple leaf having the sub-divisions extending considerably more than half-way to the base.

PALMBLAD, *pâm′blâd*, VILHELM FREDRICK: Swedish writer of considerable merit, and one of the earliest and most zealous promoters of the literature of his native country: 1788–1852; b. Liljested, in East Gotland, where his father held a post under govt. While a student at Upsala, P. purchased, 1810, the univ. printing-press, and immediately entered on the publication of several literary and scientific periodicals, the first in Swedish. These contributed materially to the diffusion of general information and to the creation of a public taste for learning. P. and his associates aimed through these journals to supplant the pseudo-classical school of literature in favor of the romantic style, and to counteract the false French taste which under Gustavus III. had been universally followed in Swedish literature and art. P. successively occupied the chairs of history and geography and of Greek literature in the Univ. of Upsala. His works were numerous; and besides those purely instructive were some good novels. P. was editor of the great Swedish biography (Stock. 1835–52); and was an active contributor to various German works of celebrity, as Ersch and Grüber's *Allgemeine Encyklopädie*, the *Conversations-Lexikon*, etc.

PALMELLACEÆ, *păl-mĕl-lā′sē-ē:* family or group of *Algæ*, of order or sub-order *Confervaceæ*. In organization, they are among the lowest of plants; they are, however, universally regarded as vegetable, and do not, like the *Diatomaceæ*, occupy a somewhat doubtful position between the animal and vegetable kingdoms. The P. all grow on damp surfaces, but some under the influence of fresh water, and some of salt. Some appear as a mere powdery layer, the granules of which have little adherence to each other, as Red Snow (q.v.); some assume the form of a slimy film or gelatinous mass, as Gory Dew (q.v.); and some are more firm and membranous, with something of the character of a frond. The P. bear so great a resemblance to the early stages of plants higher in organization that doubts are entertained of their right to a distinct place in the botanical system, particularly as their mode of reproduction is not yet well understood. Conjugation has been observed in some of them. They propagate with great rapidity by gemmation or something like it, some sending forth tubular filaments from their cells, the extremities of which dilate into new cells, after which the connecting tube closes and ceases to exist; while in others the multiplication of cells takes place by division or segmentation (see MONAD), and the young plants exhibit remarkable powers of motion for a short time, like zoospores, being furnished with vibratile cilia, by which their motion is produced. Ere long, however, their motion ceases, and the process of segmentation is ready to begin anew. The motile organs and powers of some of the P., in the earlier part of their existence, have led to their being mistaken for animalcules.

PALMER, *pâ′mėr:* town in Hampden co., Mass.; on the Boston and Albany and the Central Vermont railroads, a terminus of the Ware River railroad, and on the Chicopee river; 15 m. e. of Springfield, 84 m. w.s.w. of Boston. There are five villages: Palmer, Three Rivers, Thorndike, Bond's Village, and Duckville—all post-villages, except the latter. There are 5 churches in Palmer: Congl., Bapt., Univ., Advent, and Rom. Cath.; 2 in Thorndike: a Congl., formerly Presb. (organized about 1731), and a Rom. Cath.; 3 in Three Rivers: Bapt., Union Evangelical, and Rom. Cath.; 3 in Bond's Village, 2 Rom. Cath. and 1 Meth. Episc. The village schools are graded, and there is an excellent high-school. There is a weekly newspaper at P., a national bank (cap. $100,000), and a savings bank. The village of P. is supplied with water by a private company, the streets are lighted with electricity, and there is an organized fire dept. Among the manufacturing establishments are a woolen-mill, yarn-mill, carpet factory, wire-mill, and foundry, at P.; a cotton-mill, employing about 625 hands and annually producing 9,000,000 yds. of cloth, at Three Rivers; 2 mills making plain and fancy tickings and employing 600 hands, at Thorndike; and a mill at Bond's Village, with an annual product of 5,000,000 yds. of duck and flannel. Pop. tp. (1870) 3,631; (1880) 5,504; (1890) about 6,500.

PALMER, *pâ′mėr* [Lat. *palmifer*, palm-bearer]: term denoting one of those numerous classes of PILGRIMS (q.v.) whose origin and history are interesting studies in the social life of mediæval Europe. The P., properly so called, was a pilgrim who *had performed* the pilgrimage to the HOLY SEPULCHRE (q.v.), and had returned or was returning home after the fulfilment of his vow. The palmers were so called from their carrying branches of the oriental palm, in token of their accomplished expedition. On arriving at their home, they repaired to the church to return thanks to God, and offered the palm to the priest, to be placed upon the altar. The palms so offered were frequently used in the procession of Palm Sunday. Even after the time of his return, the religious character of the P. continued; and though his office might be supposed to have ceased with the fulfilment of his vow, many palmers continued their religious peregrinations even in their native country. They were thus—as distinct from *pilgrims*—a class of itinerant monks, without fixed residence, professing voluntary poverty, observing celibacy, and devoted to visiting at stated times the most remarkable SANCTUARIES (q.v.)

of the several countries of the West. Their costume was commonly the same as that of the ordinary PILGRIM (q.v.), though modified in different countries.

PALMER, *pâ'mėr*, ALICE ELVIRA (FREEMAN), PH.D., L.H.D.: born Colesville, N. Y., 1855, Feb. 21. At the age of 17 she entered the Univ. of Michigan, graduating with honor 1876. She taught for a year at Geneva Lake, Wis., and during the two succeeding years was principal of the university preparatory school at East Saginaw, Mich.; was prof. of history in Wellesley College, Mass., 1879–81, acting pres. of Wellesley College 1881, and pres. 1882–87, Dec. 22. She was married 1887, Dec. 23, to Prof. George Herbert Palmer, of Harvard Univ., and travelled in Europe 1888, June—1889, Sep. She received the degree PH.D. from the Univ. of Michigan 1882, and that of doctor of letters from Columbia College 1887. She has delivered many addresses on educational subjects; been a member of numerous educational committees, societies, and boards of schools for girls; a trustee of Wellesley College; pres. of the Collegiate Alumnæ Association; a member of the Mass. state board of education; and is, 1890, a member of the school board of the city of Cambridge.

PALM'ER, EDWARD HENRY: Oriental scholar: 1840, Aug. 7—1882, Aug. 11; b. Cambridge, England. After attending school during his boyhood, he became a clerk at London, and showed a remarkable talent for acquiring languages by intercourse with people of other nationalities. On account of a severe and apparently fatal illness, he returned to Cambridge 1859. Here he became acquainted with a prof. of Eastern languages, and on the return of health, 1860, commenced a course of oriental studies. He entered St. John's College, was elected a fellow 1867, on account of his proficiency in Eastern tongues, and received the degree M.A. 1870. He went with the expedition for the survey of Sinai 1868, the following year was in the service of the Palestine Exploration Soc., and in company with Drake made a tour of the South Country. P. was prof. of Arabic in Cambridge Univ. 1871–81, and went to the East 1882, at the request of the govt., to aid the English, by his knowledge of the language and his influence with the Arabs, in the war with Egypt. He rendered efficient service; but while on a mission in the desert, he was with two companions, captured, and, by order of the govt. of the province, put to death. Among the works of P. are: *The Negeb, or South Country of Scripture* (1871); *The Desert of the Exodus* (1871); a *Persian-English and English-Persian Dictionary* (1875); and numerous brilliant translations from the Persian and other Eastern languages.

PALM′ER, Erastus Dow: sculptor: b. Pompey, N. Y., 1817, Apr. 2. When a boy, he learned the carpenter's trade, which he followed till 1846, when he was so successful in cutting a portrait of his wife on a shell that he gave his time for two years to cutting cameos. He then engaged in sculpture. His first work in this direction was *The Infant Ceres*, which gave him considerable fame at its public exhibition 1850. Since that date, he has cut a large number of figures in marble, including portrait busts of Alexander Hamilton, Com. M. C. Perry, Gov. E. D. Morgan, and other prominent men; numerous mythological characters; a representation of the *Landing of the Pilgrims;* and a statue of Robert R. Livingston, which received a prize at the Centennial Exhibition.

PALM′ER, Innis Newton: born Buffalo, N. Y., 1824, Mar. 30. He graduated from West Point 1846, was appointed 2d lieut. 1847, and was brevetted 1st lieut. and capt. for brilliant service in the Mexican war. He then served on the frontier, and by various promotions reached the rank of major 1861. In the civil war he was in command of a cavalry force at the battle of Bull Run, and won a brevet of lieut.col.; served in the Army of the Potomac, organized volunteers, was stationed for some time in N. C., and besides other service aided the army of Gen. Sherman in that state. He was promoted lieut.-col. 1863, brevetted brig.gen. U.S.A. and maj.gen. vols. 1865, left the volunteer service 1866, served in the west, was promoted col. 1868, and retired 1879, Mar. 20.

PALM′ER, James Shedden: 1810–1867, Dec. 7; b. New Jersey. At the age of 15 he joined the navy as a midshipman; was in several battles at Sumatra 1838; commanded one of the schooners of the blockading force in the Mexican war; at the opening of the civil war was with the Mediterranean squadron, but was soon called to join the blockading fleet on the s. Atlantic coast; was prominent at the battle of Vicksburg, and won the warm friendship of Admiral Farragut for gallantry in that action; was flag capt. of Farragut's force at New Orleans and Mobile, and was appointed to the command of one of the Atlantic squadrons 1865. He was promoted lieut. 1836, commander 1855, capt. 1862, commodore 1863, and rear-admiral 1866. He died at St. Thomas, W. I., of yellow fever.

PALM′ER, John McCauley: born 1817, Sep. 13, at Eagle Creek, Ky. He commenced practicing law at Carlinville, Ill., 1840; was a member of the constitutional convention of the state 1847, and of the state senate 1852–54; was one of the founders of the republican party, a delegate to the national convention of the party 1856, and a presidential elector 1860; and a member of the peace convention at Washington 1861. On the opening of the war he promptly entered the Union army, and by a unanimous vote was chosen col. of the 14th Ill. infantry. He went with Gen. Fremont to n. Mo. 1861, in

1862 aided Gen. Pope in the battles at New Madrid and Island No. 10, and in the latter engagement, and subsequently at the battle of Stone River, rendered brilliant service. He was also in the battle of Chickamauga, commanded a corps in the Atlanta campaign, and was afterward assigned to the dept. of Ky. He was promoted brig.gen. vols. 1861 and maj.gen. vols. 1862; was gov. of Ill. 1869–73; was unsuccessful as dem. candidate for gov. 1888, also for the U. S. senate 1889, Jan. 23.

PALM'ER, JOSEPH: 1718–1788, Dec. 25; b. Mass. He was elected to the provincial congress 1774, and by that body was chosen a member of the committee of safety. He was appointed col. of militia, and was for some time in active field service, defending the coast in the vicinity of Boston; was promoted brig.gen., and 1777 led the Mass. troops in the defense of Rhode Island. He died at Roxbury, Mass.

PALM'ER, RAY, D.D.: 1808, Nov. 12—1887, Mar. 29; b. Little Compton, R. I. He graduated from Yale 1830, taught school in New York and New Haven, and was pastor of a Congl. church, Bath, Me., 1835–50. In the latter year he became pastor of the First Congl. Church in Albany, N. Y., with which he remained till 1866, when he accepted the office of sec. of the Amer. Congl. Union, which he held 12 years. He wrote several valuable works, but is most widely known by his hymns, several of which are among the most widely popular of American sacred lyrical productions. Of these, *My Faith Looks Up to Thee* has appeared in more than 20 languages, and *Stealing from the World Away*, *And Is There, Lord, a Rest?*, with numerous others, have attained a great popularity. Among his books are: *Remember Me* (1855, 2d ed. 1873); *Hymns of My Holy Hours* (1866); *Home, or the Unlost Paradise* (1868); *Complete Poetical Works* (1876); and *Voices of Hope and Gladness* (1880). In his latter years he resided in Newark, N. J., where he died.

PALM'ER, ROUNDELL (Lord SELBORNE), D.C.L.: born Mixbury, England, 1812, Nov. 27. He graduated with high honors from Trinity College, Oxford, 1834; was a fellow at Magdalen College, studied law, and commenced practice 1837. He became a member of parliament 1847, was defeated 1852, and was again a member 1853–57. In 1849 he was appointed queen's counsel, became solicitor-gen. 1861, and in the same year was knighted and returned to parliament. He was atty.gen. 1863–66, and 1868 was offered by Mr. Gladstone the position of chancellor, which he declined because he was not in harmony with the administration on the question of cutting off the endowments of the Irish Church. At the consideration of the 'Alabama Claims' by the arbitration commission at Geneva 1871–2, he was counsel for the British govt.; was raised to the peerage 1872, with the title of Baron Selborne of Selborne, and became lord chancellor, which office he held till 1874, Feb. He was elected 1877 lord rector of St. Andrews Univ., and, though holding different views on the Irish land question from other members of the cabinet, again became lord chancellor 1880, and retained the office till 1885. He declined to become a member of the cabinet 1886, and for some years has been a member of the liberal unionist party. He has strongly advocated the formation of a great law univ. in London. He has edited *The Book of Praise, from the Best English Hymn-Writers* (1862); and published: *Notes on Some Passages in the Liturgical History of the Reformed English Church* (1878); *The Case against Disestablishment* (1886); and *Churches and Tithes* (1887).—His brother, WILLIAM P., b. England, 1811, July 12, graduated from Oxford 1830, and, after taking orders went to the East to promote union of the Anglican and Oriental churches, and became a Rom. Cath. 1856. He has written religious and controversial works.

PALMERSTON, *pâ′mėr-ston* (HENRY JOHN TEMPLE), Viscount: English statesman: 1784, Oct. 20—1865, Oct. 18; b. at the family mansion, Broadlands, near Romsey, Hants. The Temples are of Saxon origin, and the family claim descent from Edwyn, who was deprived of the earldom of Mercia by the Conqueror, and lost his life in defending himself against the Normans 1071. Sir William Temple, diplomatist and patron of Swift, was of this family, which removed to Ireland in the time of Elizabeth. The family was ennobled 1722, when Henry Temple was created a peer of Ireland, with the dignities of Baron Temple and Viscount P. His grandson, second viscount, father of the famous peer, superintended his son's education at Broadlands, and then sent him to Harrow. Young P. afterward went to the Univ. of Edinburgh; and matriculated at St. John's College, Cambridge, whence he was summoned to the death-bed of his father, on whose decease, 1805, P. succeeded to the title. His eminent abilities were early recognized, for he was scarcely of age when the tory party in the univ. selected him (1806) as their candidate to succeed Mr. Pitt in the representation. The Marquis of Lansdowne was the whig candidate; and Lord Byron, then at Cambridge, evinces in his *Hours of Idleness* his interest in the election. P. was unsuccessful, and again in 1807. He entered parliament, however, in the same year for the borough of Newtown, Isle of Wight, his colleague being Arthur Wellesley, then chief secretary of Ireland. In 1811 he exchanged Newtown for the Univ. of Cambridge, and had the distinction of representing his *alma mater* 20 years, losing his seat only when he became a member of the Grey administration, and supported the Reform Bill. For the last two years of the unreformed parliament, he sat for the now extinct borough of Bletchingly. At the first election after the Reform Act, he was returned for S. Hampshire, but lost his seat at the general election 1835. He immediately afterward found a seat for the borough of Tiverton, which he promised never to leave as long as the electors would permit him to represent them.

Turning to his official career, we find P. beginning public life as a member of the tory party, and as sec. at war in the Duke of Portland's administration 1809. This office he held during the successive governments of Perceval, the Earl of Liverpool, Canning, Lord Goderich, and the Duke of Wellington—1809–28. The British military system swarmed with abuses, and the labor thrown upon the sec. at war during the Peninsular campaigns was prodigious. In 1817 an attempt was made to assassinate P. by an insane army-lieut. named Davis, who fired a pistol at him as he was entering the horse guards, inflicting, however, only a slight wound. P. early attached himself to the Canning section of the Liverpool administration, and accepted a seat in the cabinet of Mr. Canning. His official connection with the tory party ceased 1828, when the 'great Duke' insisted on accepting Mr. Huskisson's resignation, which was followed by P.'s retirement. The duke's govt. was swept away in the reform flood of 1830; and Earl Grey, who became prime minister, offered the seals of the foreign office to Palmerston. The European horizon was so disturbed at this crisis that a great political authority declared that if an angel from heaven were in the foreign office, he could not preserve peace three months. P. falsified the prediction. Louis Philippe then filled the throne of France; and for the first time on record, England and France acted in concert and without jealousy, under P.'s foreign ministry. He led in effecting the independence of Belgium, and in establishing the thrones of Queen Isabella of Spain and Queen Maria of Portugal on a constitutional basis. In 1841 P. went out of office with the whigs on the question of free trade in grain; but on their return 1846, he resumed the seals of the foreign office. His second foreign administration furnished various subjects of hostile party criticism, among which were the civil war in Switzerland, the Spanish marriages, the European revolutions in 1848, the rupture of diplomatic relations between Spain and Great Britain, and, finally, the affair of Don Pacifico and the quarrel with Greece. A vote of censure on the foreign policy of the govt. was, 1850, carried in the house of lords on motion of Lord Stanley (afterward Earl of Derby). A counter-resolution, approving the foreign policy of the govt., was thereupon moved by Mr. Roebuck in the lower house. The debate lasted four nights. In a speech of five hours' duration—'that speech,' said Sir Robert Peel, 'which made us all so proud of him'—P. entered on a dignified vindication of his foreign policy; and Mr. Roebuck's motion was carried by a majority of 46. 1851, Dec., the public were startled at the news that P. was no longer a member of the Russell cabinet. He had expressed his approbation of the *coup-d'état* of Louis Napoleon, without consulting either the premier or the queen; and as explanations were refused, her majesty exercised her constitutional right of dismissing her minister. P. avenged himself, as soon as parliament met, by shattering the Russell administration to pieces on a comparatively trifling question regarding the militia. He refused an offer from the Earl of Derby to join the govt. which he was commissioned to form, but accepted the post of home sec. in the coalition administration of the Earl of Aberdeen 1852. The fall of this govt., on Mr. Roebuck's motion for a Sebastopol committee, placed P. in his 71st year in the position of prime minister, to which he was unanimously called by the voice of the nation. He vigorously prosecuted the Russian war until Sebastopol was taken and peace was made. His govt. was defeated 1857, Mar., on Mr. Cobden's motion condemnatory of the Chinese war. Parliament was dissolved, and P. met the house of commons with a large majority. But his administration fell 1858, Feb., on the Conspiracy Bill, intended to protect the French emperor against the machinations of plotting refugees. A short conservative administration followed; but 1859, June, P. was again called to the post of first lord of the treasury, which he filled till his death. It was his ambition to be considered the minister of a nation rather than the minister of a political party; and his opponents have been constrained to admit that he held office with more general acceptance than any English minister since the time of the great Lord Chatham. As an orator, he was usually homely and unpretending, but always sensible and practical. He was a dexterous tactician, and a ready, witty, and often brilliant debater. He was popular as a minister, because he was thoroughly English in his ends and aims—a statesman of the traditional aristocratic type, liberal, but far from radical. His political opinions were like those of Pitt. Even his robust health, manly bearing, and physical vigor were elements of his popularity, because they were regarded as a glorification of the English sports, which he was never ashamed to patronize. He desired nothing so ardently as to promote the wealth and grandeur of Great Britain, and his national character and national spirit, finding sometimes imperious utterance, were thoroughly appreciated by his countrymen; though the leaders of even his own party are thought to have largely disapproved of his strong expressions as undiplomatic, and of his artifices as too deep for sincerity, yet too shallow for success. He married, 1839, the widow of the fifth Earl of Cowper, daughter of the first Viscount Melbourne. As he died without issue, and his only brother died unmarried, the title became extinct at P.'s decease. See *Life of P.*, by **Sir Henry Lytton Bulwer (Lord Dalling), continued by Evelyn Ashley.**

PALM′ER-WORM: name given to many large kinds of grub, larvæ of coleopterous insects, destructive to vegetable substances of various kinds. The name is supposed to have been given from their wandering about like a palmer or pilgrim. It is used in the English version of the Old Test. as the translation of the Hebrew *gazam*, rendered *kampe* by the Septuagint, which modern Hebrew writers and others generally regard as a kind of locust, though more probably it is either the grub of a coleopterous, or the caterpillar of a lepidopterous, insect.—See Kitto, in *Pictorial Bible*, on Joel i. 4.—*Palmer-flies* are much used by anglers on English streams, and are at certain seasons excellent lures for trout, etc.

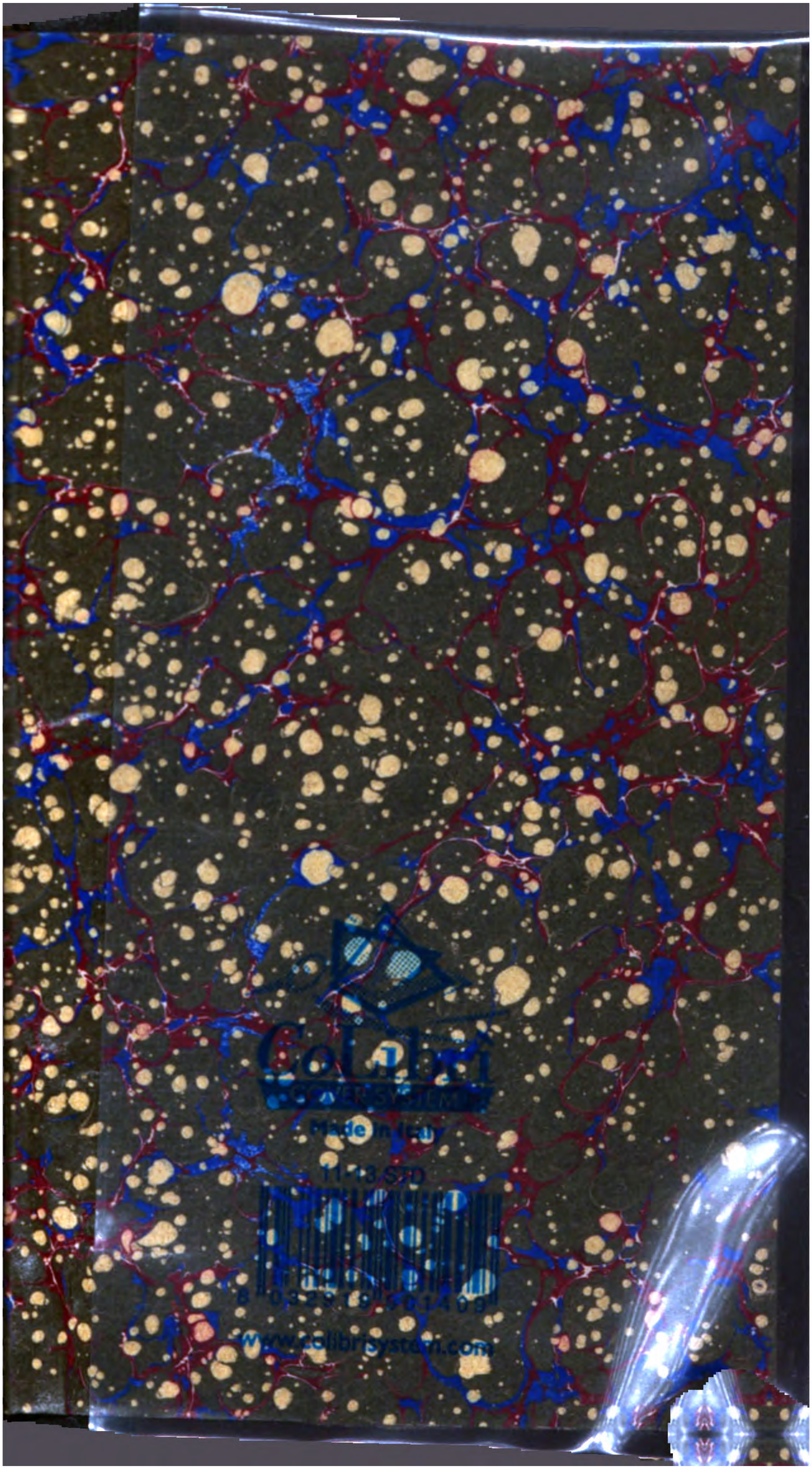
PALMETTO, n. *păl-mĕt′tō* [dim. of the L. *palma*, a. palm: Sp. *palmito*, the palmetto], (*Sabal palmetto* or *Chamærops palmetto*): name of several varieties of fan-palm, in different genera. One that may be called typical is the *cabbage-palmetto*, native of s.e. maritime parts of N. America, as far n. as lat. 35°—further n. than any other Amer. species of palm is found. It attains a height of 40–50 ft., and has a crown of large palmated leaves, the blade from one ft. to five ft. in length and breadth, and the foot-stalk long. The flowers are small, greenish, and in long racemes; the fruit black, about as long as a pea-pod, and uneatable. The leaves are made into hats. The terminal bud or *cabbage* is eaten, whence the name CABBAGE PALM (q.v.). The wood is extremely porous; but is preferred to other wood in N. America for wharves, as it is very durable, and not liable to be attacked by worms.—The P. is part of the device on the state flag and seal of S. C.—The hemp-palm, *Chamærops* (q.v.) *humilis*, of s. Europe, also is called Palmetto.—*Palmetto Fibre* is a material for bagging obtained from the saw palmetto-tree, *Sabal serrulata*, which grows plentifully in the states bordering the Gulf of Mexico. About 1888, the cotton-planters of the south, as a measure of defense against the trust which monopolized the jute bagging used for covering the cotton bales, began to make a bagging of fibre obtained from the 'straw' or leaves of the yellow or long-leaved pine (*Pinus australis*), also from stalks of the cotton-plant. P. fibre is a more recent substitute for jute. It is claimed that 2 tons of the green plant yield 1 ton of dry leaves and stems, from which can be obtained $25 worth of tannic acid and $15 worth of bagging fibre, besides $4 worth of refuse suitable for paper stock. P. fibre is asserted to be 20 per cent. stronger than jute fibre.

PALMET′TO-LEAVES: leaves of the Palmyra (q.v.) palm, *Borassus flabelliformis*, which grows extensively in India and Polynesia. The leaves have great value as material for manufacture of hats, mats, etc., and are frequently exported to western lands. In their native country, they are used as thatch, and for a great variety of other useful applications.

PALMI, *pâl'mē*, or PALME, *pâl'mā:* royal city of s. Italy, province of Reggio-Calabria, 20 m. n.n.e. of Reggio, on the coast of the Bay of Gioja. The town, through its port, carries on active trade. Pop. 10,500.

PALMIFEROUS, a. *păl-mĭf'ėr-ŭs* [L. *palma*, a palm; *fero*, I bear]: bearing palms.

PALMIPED, a. *păl'mĭ-pĕd* [L. *palma*, a palm; *pedes*, feet]: web-footed: N. a web-footed or swimming animal. PAL'MIPEDS, n. plu. *-pĕdz*, or PALMIPIDES, n. plu. *păl-mĭp'ĭ-dēz*, order of swimming-birds, called also WEB-FOOTED BIRDS or NATATORES or SWIMMERS; the *Anseres* of Linnæus; a natural order universally recognized by ornithologists, having the feet formed specially for swimming, and the toes *webbed*, i.e., connected by a membrane, at least those which are directed forward. In swimming, the feet are contracted when drawn forward, the toes being brought together, and expanded to their utmost extent in the backward stroke. In accordance with their aquatic habits, the P. are further characterized by a boat-like form, adapted to move through the water with little resistance; and by a dense and polished plumage, oiled by a secretion from certain glands near the tail, very impervious to water; while warmth is further secured by a clothing of down more or less abundant beneath the feathers. They are remarkable for length of breastbone (*sternum*), and the neck is often longer than the legs, a thing very unusual in birds, so that they can plunge the head far down in search of food. The length of the wings differs very much in different sections of the order, and with it the power of flying; as does also the power of diving, which some possess in high degree, and others, even of the same family, to a very small degree. To this order belong geese, swans, ducks, divers, auks, guillemots, puffins, penguins, petrels, albatrosses, gulls, terns, shearwaters, noddies, pelicans, cormorants, frigate-birds, gannets, darters, tropic-birds, etc. (See these titles.)



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